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1964

MINIMUM SAFETY STANDARDS

FOR THE

CONSTRUCTION INDUSTRY

IN

MONTANA

SAFETY FIRST

1964

Industrial Accident Board
Department of Safety

Helena, Montana

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SPECIFIC SAFETY REQUIREMENTS RELATING TO BUILDING CONSTRUCTION WORK IN THE STATE OF MONTANA

SCOPE

Section 1. The purpose of this code is to provide reasonable safety for life, limb and health of employees engaged in building and other construction work. In cases of practical difficulty or unnecessary hardship, the Industrial Accident Board of Montana may grant exceptions from the literal requirements of this code, or permit the use of other devices or methods when it is clearly evident the equivalent protection is thereby secured.

The requirements of this code shall apply to the installation, erection or construction, use, maintenance and removal of all protective equipment, temporary facilities, safety devices and safeguards used and employed in connection with all demolition, building and other construction work and all operations pertaining thereto.

Every employer shall keep a record of all injuries his employees receive at their work. This record shall be kept in such manner as to enable representatives of the Industrial Accident Board to determine by examining the record, the injury rate of the employed force for the periods covered by the report.

Every employer shall investigate or cause to be investigated every accident resulting in a disabling injury that his employees suffer in connection with their employment. He shall promptly take any action thus found to be advisable. Employees shall assist in the investigation by giving any information and facts they have concerning the accident.

DEFINITIONS

Section 2. For the purpose of this code the following definitions shall apply. Terms not defined herein shall be understood as having their usual and common meaning unless a different meaning is plainly required by the context:

A. "Approved" herein used means approved by the Industrial Accident Board of Montana.

B. The phrase "Building and other construction work" when used in this code shall mean and include the demolition, dismantling, excavation, construction, erection, alteration, repair, painting, decorating, glazing, cleaning and pointing of buildings and other structures and all operations in

connection therewith; the excavation, construction, alteration and repair of subways, sewers, tunnels, trenches, conduits, pipelines, roads and all operations pertaining thereto; the moving of buildings and other structures, and to the construction, alteration, repair or removal of wharfs, dock, bridges, culverts, trestles, piers, abutments, or any other construction, alteration, repair or removal work carried on in, above or over water.

C. "Crawling Board or Chicken Ladder" means a single plank or board to which cross strips or cleats are nailed at approximately twelve (12) inch intervals for crawling up or down steep inclines.

D. "Design" when used as a verb in this code, means to plan or devise a means of fulfilling requirements of this code. It does not necessarily mean the preparation of drawings.

E. "Employee" means and includes every person who may be required or directed by any employer, in consideration of direct or indirect gain or profit, to engage in any employment or to go, or work, or be at any time, in any place of employment covered by the Workmen's Compensation Act.

F. "Employer" means and includes every person, firm, corporation, agent manager, representative, or other person covered by the Workmen's Compensation Act, having control or custody of any employment, place of employment or of any employee.

G. "Equipment" when herein used shall include all machinery, tools, devices, derricks, hoists, elevators, scaffolds, platforms, runways, ladders and all such facilities, safeguard and protective construction used in connection with construction operations.

H. "Equivalent" when herein used, shall be interpreted to mean alternative design, features or strength which will provide an equal or greater degree of safety.

I. "Guarded" means that the object is so covered, fenced, enclosed or otherwise protected that the accidental contact with the point of danger is reasonably remote.

J. "Standard Guard Rail" means a railing substantially constructed, not less than thirty-six (36) inches nor more than forty-two (42) inches in height and unless the space between the railing and the floor be enclosed with some substantial material, an intermediate rail located midway between the top rail and the floor shall be provided.

K. "Suitable Eye Protection" means the type of goggle or eye shield worn that will afford adequate eye protection for the hazard involved.

L. "Factor of Safety" means the ratio between the ultimate breaking

strength and the allowable safe unit working stresses of the material, structure or device. The term "Factor of Safety of Four (4)" means that the material, structure or device shall be constructed of such strength that the load for which it is designed will be one-fourth (¼) the ultimate breaking load. Where other factors of safety appear they shall apply in the same manner. Standard engineering handbooks may be used in determining the strength of material except as otherwise provided herein.

M. Hoists:

1. A mobile hoist means a self-propelled unit having all the component parts of a stationary steel hoist.
2. A mast hoist means a hoist having not over two upright members forming the hoist mast and which can be moved on the foundation skids but which is not self-propelled.
3. A gin pole means a lifting device consisting of a single upright member securely fastened at its base and supported in place by anchored guy lines.
4. A tripod hoist means a lifting device consisting of three (3) up-right members or legs securely fastened together at the top in such a manner as to permit the legs to be spread at various angles sufficient to support tripod in an upright position.
5. An "A" frame hoist means a hoist consisting of two (2) up-right members joined together at the top with the legs spread to form substantial base and supported by guy lines from the top of the frame.

N. "Ladder" means an appliance designed for use in ascending or descending at an angle with the horizontal, usually consisting of two side pieces called side rails, joined at regular intervals by cross pieces called rungs, cleats or treads.

1. "Cleat Ladder" means a ladder consisting of one (1) section having two (2) side pieces called side rails, joined at regular intervals by cross pieces attached to the side rails with fillers between the cleats or dapped into the side rails.
2. "Extension Ladder" means a ladder consisting of two or more sections traveling in guides or brackets so arranged that it may be adjusted to variable lengths.
3. "Fixed Ladder" means a ladder securely fastened in a fixed position.

4. "Sectional Ladder" means a ladder consisting of two or more sections so constructed that the sections, when combined, will function as a single ladder.
5. "Single Ladder" means a ladder consisting of but one section.
6. "Step Ladder" means a ladder that is a self-supporting portable ladder, non-adjustable in length, having flat steps or treads and a hinged back.
7. "Trestle or 'A' Ladder" means a ladder consisting of two (2) single ladders hinged or joined at the top to form equal angles with the base.
8. "Extension Trestle Ladder" means a ladder consisting of an "A" or Trestle Ladder with an additional vertical single ladder, having parallel sides, which is adjustable perpendicularly and is provided with a device to lock it into place.

O. "Paint Materials" for the purpose of this code shall be defined as any material such as paint, varnish, stains, shellac, thinners, lacquers, dryers, size, varnish removers, bronzing liquids, enamel, colors dry or ground in oil, which are used for the preparation, finishing, decoration or protection of surfaces on buildings, structures or any parts thereof.

P. Painters' and Decorators' Scaffold Platform—

1. "Kick Plank" means a platform that shall rest upon horizontal and parallel stringers, or other bearers and be moveable along the course of the stringer or bearer.
2. "Scaffold Plank" means a wooden timber not less than two (2) inches in thickness or less than ten (10) inches in width.
3. "Ladder Scaffold Plank" means a platform similar in construction to a narrow ladder with light decking strung upon and attached to the rungs.

Q. "Platform" means the temporary flat working surface used to support workmen and/or material and/or equipment.

R. "Protective Equipment" means any appliance used or required to be used to prevent injury to workmen.

S. "Ramp" means an inclined runway.

T. "Runway" means any aisle, walk, drive or temporary floor constructed or maintained as a passageway for workmen or rolling equipment.

U. "Scaffold" means an elevated platform used for supporting workmen and/or equipment and/or material in connection with any of the operations coming within the scope of this code.

1. "Built-up Scaffold" means a rigidly constructed scaffold or assembled scaffold, built up where it is going to be used and dismantled when its purpose has been accomplished.

2. "Carpenter's Bracket Scaffold" means a scaffold, the platform of which is supported on triangular braced brackets secured to the side of the building.

3. "Float or Ship Scaffold" means a scaffold hung from an overhead support by means of ropes, and consisting of a platform of planks fastened together by a diagonal board underneath the platform, and resting upon and securely fastened to two (2) parallel plank bearers at right angle to the span.

4. "Foot Scaffold" means a scaffold used to give additional height, the platform of which shall not exceed eighteen (18) inches above the supporting surface.

5. "Horse Scaffold" means a scaffold, the platform of which is supported by horses.

6. "Independent Pole Scaffold" means a scaffold supported from the base by a double row of uprights, independent of support from the walls and constructed of uprights, ledgers, horizontal platform bearers and diagonal bracing.

7. "Ladder Jack Scaffold" means a scaffold, the platform of which is supported on built-up jacks attached to ladders.

8. "Mason's Suspended Scaffold" means a platform suspended by steel wire rope and mechanically operated.

9. "Mason's Square Scaffold" means a scaffold, the platform of which is supported on built-up squares secured to each other by diagonal bracing.

10. "Needle Beam Scaffold" means a scaffold consisting of a plank platform resting on two parallel horizontal beams called "needle beams" supported by ropes.

11. "Outrigger Scaffold" means a scaffold, the platform of which is supported by outriggers or thrustouts projecting from the wall of the building, the inner end of which is securely fastened.

12. "Single Pole Scaffold" means a scaffold supported from the base with but one row of uprights, located at the outer edge of the platform, the platform being supported by bearers or putlogs securely fastened to the uprights and walls. The outer ends of the

bearers or putlogs are supported on ledgers secured to the uprights and the inner end resting in the wall.

13. "Suspended Scaffold" means a scaffold supported from above, the platform of which is supported at more than two (2) points by steel wire cables suspended from overhead outriggers which are securely fastened to the framework of the building.

14. "Swinging Scaffold" means a scaffold, the platform of which is supported by stirrups or hangers suspended from overhead supports.

    a. "Boatswain's Chair" means a seat to support a workman in a sitting position supported by rope slings crossed diagonally under the seat and attached to a suspension rope.

15. "Trestle Ladder Scaffold" means a scaffold constructed for light work, the platform of which is supported by trestle ladders.

16. "Window Jack Scaffold" means a scaffold constructed for light work, the platform of which is supported by trestle jack or thrust-out which projects through a window opening.

17. Scaffold Units or Parts:

    a. "Brace" means a member that holds one member in a fixed position with respect to another member.

    b. "Bearer" means a member designed to support or carry the load imposed.

    c. "Ledger" means a scaffold member which extends horizontally from post to post at right angles to the putlogs or bearers, supports the putlogs or bearers, forms a tie between the posts and becomes a part of the scaffold bracing.

    d. "Putlog" means a scaffold member, upon which the platform rests. In a single pole scaffold, the outer end of the putlog rests on a ledger and the inner end rests in the wall. In an independent pole scaffold, each end of the putlog is also called a bearer.

    e. "Stringer" means a horizontal member spanning the interval between elevated supports and shall be composed of either scaffold plank or kick plank.

f. "Square" means a framed structure built up of vertical and horizontal members and braces which when used in pairs and set up and braced longitudinally and diagonally provides a support for a working platform.

V. "Securely Fastened" means that the object or thing referred to shall be so secured in place that it cannot under normal reasonably forseen conditions or circumstances, be accidentally or unintentionally displaced, and that the object or thing referred to will be upheld and will withstand such weight or shock as is reasonably expected from normal weather conditions or circumstances of use.

W. "Structure" means that which is built or constructed, an edifice or building of any kind, or any piece of work artificially built up or composed of parts joined together in some definite manner.

X. "Substantial" when used herein shall mean construction of such strength, of such materials, and of such workmanship that the object will withstand all reasonable expected wear, usage or shock to which it may be subjected.

Y. "Toe Board" means a barrier placed along the edge of a scaffold, platform, runway, floor opening, etc., and secured thereto to guard against the falling of material.

Z. "Wall Openings" shall be understood to mean openings in walls from which there is a clear drop of six (6) feet or more and shall include openings giving access to yardarms or block and tackle, doorways and other openings thirty (30) inches or more in height and eighteen (18) inches above the floor or platform level. Open sides of buildings between columns, girders or piers shall not be considered as wall openings.

AA. "Working Loads" of a material as used in this code shall mean the load which has been found to be the safe load and unless otherwise specified will give a factor of safety of not less than four (4) against rupture.

BB. For the purpose of this code and whenever the content will permit, the singular shall include the plural and the plural shall include the singular. All wording, unless specifically defined, shall have the meaning given in Webster's Unabridged Dictionary.

CHAPTER I

PERSONAL PROTECTIVE AND MATERIAL STANDARDS

Personal Safeguards

Section 1. Employees shall be fully clothed and clothing shall be of the type suitable for the job. Employees shall wear an approved type "hard hat" when working under any scaffolding, temporary flooring or framework; or when working at such a location as to be exposed to the possibility of being struck on the head with any falling or flying object. Employers and inspectors are to encourage wearing of such hard hats by all construction workers at all times. Gloves should be worn as necessary to prevent injury from splinters.

Approved type safety shoes shall be worn in all instances. The wearing of tennis or "sneaker-type" shoes shall not be permitted.

Section 2. The employer shall provide suitable eye protection for all employees engaged in the following construction operations and it shall be the responsibility of the employee to use the equipment provided by the employer:

a. Reclaiming brick and cutting, chipping, drilling, cleaning, buffing, grinding, polishing, shaping or surfacing masonry, concrete or similar substances with hand tools or mechanical equipment.

b. Chipping or cleaning of metallic materials.

Section 3. Where a dust arising from the operation covered in Section 2a is visible in the working area, the employer shall provide and it shall be the responsibility of the employee to wear an approved respirator, unless an effective exhaust system or a wet method is used.

Section 4. Where employees use any solution that is known to be injurious to the eyes or hands in cleaning operations on buildings or structures, the employer shall provide suitable eye protection and/or acid-resisting gloves when necessary, and it shall be the responsibility of the employee to wear the protective equipment provided.

Section 5. Employees engaged in cleaning operations by sand or shot blast shall be provided with approved respirators, hoods or helmets and it shall be the responsibility of the employee to wear the protective equipment provided.

MATERIALS USED IN SCAFFOLDS, TEMPORARY FACILITIES OR PROTECTIVE EQUIPMENT

Steel

Section 6. The physical properties of all structural steel or other metal parts used in the construction of scaffolds, temporary facilities or protective equipment mentioned in this code shall be such as to carry the maximum working load herein specified and shall provide a factor of safety of not less than four (4).

Lumber

Section 7. Lumber permissible for use in the construction of scaffolds, temporary facilities or protective equipment provided for in this code shall be reasonably straight and close grained, free from defects such as ring shakes, cross grain, unsound or loose knots, knots of large size, knots in groups, decay or other visible defects which materially impair its strength. Discarded scrap lumber cannot be used in the construction of scaffolds unless it conforms with all requirements of this code. Packing boxes, barrels, piles of loose lumber or other makeshift material (including mason units) shall not be used in the construction of scaffolds.

Structural members of lumber in their various uses as provided for in this code shall be so proportioned that the unit stresses will not exceed the values listed in Table I, Appendix, of the unit working stresses which are based on recommendations of the Forest Products Laboratory, U. S. Forest Service. The stresses given are for common grade lumber for two conditions of exposure during use:

a. Dry. Timber continuously dry.

b. Wet. Timber more or less continuously damp or wet, when exposed to water or when in contact with earth.

For lumber occasionally wet, but quickly dried, as in exposed work, not in contact with water or earth, values obtained by averaging the values given for wet and dry conditions may be used.

For the purpose of this code lumber measurements are for standard commercial sizes.

Section 8. In the construction and erection of safety devices, safeguards, temporary facilities and protective equipment provided in the requirements of this code and wherein the construction or the factor of safety is not specified, such devices, safeguards, protective equipment, etc., shall be constructed so

as to provide a safety factor of not less than four (4), as defined in Paragraph L, Section 2.

Nails

Section 9. Nails used in the construction of temporary facilities and protective equipment shall be not less than eight (8) penny and shall be driven full length and of sufficient quantity to securely fasten the materials nailed. Nails used in such construction shall not be subject to direct tension. Double-headed or washer type nails may be used so long as their use does not create a tripping hazard.

Section 10. Bolts, screws or other mechanical or patented fasteners used in the erection of temporary facilities and protective equipment shall be substantially and securely fastened.

Ropes, Cables, Chains

Section 11. Manila ropes used to support a load shall be inspected under the supervision of the employer or his authorized agent before use and weekly thereafter. Visual inspection shall be made for abrasions, broken fibers, cuts, fraying or other defects. Manila ropes showing any of the above defects shall have the twist thrown out and examined for internal wear and abrasion. Manila ropes found to have defects under such inspection and examination and Manila ropes which have been injured with acid shall be removed from such service. Rope of other materials with equivalent strength and safety factor may be used.

Section 12. Ropes, cables and chains shall not be used for loads in excess of the allowable loads given for each in Table V, Appendix.

Section 13. Wire ropes or cables shall be inspected under the supervision of the employer or his authorized agent at the time of installation and once each month thereafter when in use, and shall be removed from hoisting or load carrying service when any one of the following conditions exist:

a. When three (3) broken wires are found in one lay of 6x7 wire rope;

b. When six (6) broken wires are found in one lay of 6x19 wire rope;

c. When nine (9) broken wires are found in one lay of 8x37 wire rope;

d. When eight (8) broken wires are found in one lay of 8x19 wire rope;

e. When corrosion has progressed to marked pitting;

f. Wire rope which has been idle for three (3) months or more and subject to water, moisture, dampness, etc., shall be cut off and inspected for internal corrosion, and if marked corrosion is found it shall be removed from hoisting or load carrying service;

g. When wire rope is used and not mentioned herein, it shall be inspected as above provided, when in use, and shall be removed from load carrying service when four (4) per cent of the total number of wires composing such rope is found to be broken.

Section 14. The ratio between the rope diameter and the block, sheave or pulley tread diameter shall be such as to allow the rope strands to slide past each other and adjust themselves to the bend. In no case shall the sheave diameter be less than that recommended in the manufacturer's specifications for corresponding block, sheave, and pulley diameters. Sheaves or pulleys with eccentric bores or with cracked hubs, spokes, or flanges shall be repaired or removed from service.

Section 15. All connections, fittings, fastenings, parts, etc., used in connection with ropes, cables or chains shall be of such quality and strength and so attached, connected, fastened, etc., as to provide a safety factor of not less than the carrying agent for which it was designed. Thimble and manufacturers' standard connections should be used wherever practicable.

Slings

Section 16. Manila rope slings shall not be used for handling known acid or caustic-contaminated material or objects.

Section 17. All slings shall be of a type necessary to carry the maximum working loads to be imposed upon them. Bridle slings shall be used on all horizontal loads over twelve (12) feet in length when composed of two or more pieces of material. A spreader shall be used when there is danger of the hitches slipping together.

Section 18. Slings that are found to be defective shall be destroyed.

Section 19. The use of a chain as a sling or choker in erection of steel is prohibited.

Section 20. The splicing of all wire-cables shall conform to manufacturers' standard specifications and in no case, whether of ordinary or performed wire rope, shall the over-all length of splice be less than thirty-two (32) times the rope diameter in feet and the length of the tucked ends shall be not less than twenty-four (24) times the rope diameter in inches.

Section 21. Thimbles shall be used where wire rope is looped. Clips or clamps used shall conform to manufacturers' specifications. In the use of clamps the loop ends of clamps shall be on the dead end of the cable. The grooved plate of the clamp shall take the load of the pulling part from which it is designed. In looping or in short bends, clamps and spacing of clamps shall conform to the following tables:

Diameter of Wire Rope Inches	Number of Clamps	Spacing Inches
½	2	3
⅝	3	3¾
¾	4	4½
⅞	5	5½
1	6	6

Section 22. Where any rope or cable supporting any scaffold, structure or equipment is brought over a sharp corner of steel, stone or other material liable to cut or cause undue abrasion to the rope or cable, it shall be protected at such points by the use of bagging, wooden blocks or other protective padding.

CHAPTER II

MACHINERY AND EQUIPMENT

GUARDING

Section 1. All or any part of a set or train of gears on construction machinery or equipment exposed to contact shall be completely enclosed or have a band guard around the face of the gear, with side flanges extending inward beyond the root of the teeth. Where there are openings of more than two and one-half (2½) inches between spokes or through web, the entire gear shall be enclosed.

Section 2. Frictional disc drives and sprockets shall be guarded in the manner provided for gears.

Section 3. Where a guard or enclosure is three (3) inches or less from the gears there shall be no opening in the guard or enclosure which will permit the insertion of a five-eighths (⅝) inch ball.

Section 4. Set screws, keys and other projections protruding beyond the surface of revolving parts of construction machinery or equipment, where exposed to contact, shall be covered or guarded.

Section 5. All clutches and couplings of construction machinery or equipment exposed to contact shall be completely enclosed or protected with standard railing. Where such railings are fifteen (15) inches or less from the clutch or couplings, railings shall be paneled with sheet or perforated metal, expanded metal, wire mesh or wood grille.

Section 6. All belts and pulleys on construction machinery or equipment excepting cone pulley drives and conveyor belts, when within reach of

workmen, shall be completely enclosed on all exposed sides or protected with standard railing located within eighteen (18) inches of such belt or pulley and paneled as provided in Section 5, Chapter II, when located within fifteen (15) inches of such belt or pulley.

Section 7. On construction machinery, rope and chain drives with their pulleys or sprockets shall be guarded in the same manner as belts.

Section 8. Flywheels and balance wheels on construction machinery or equipment shall be guarded with any one of the following guards:

a. With an enclosure of substantial guard material to a height of six (6) feet:

   If the guard is three (3) inches or less from the spokes to the flywheel, there shall be no openings which will permit the insertion of a five-eights (⅝) inch ball.

   If the guard is more than three (3) inches and less than fifteen (15) inches from the spokes, there shall be no openings in the guard greater than two and one-half (2½) inches.

   Removable panels or doors designed to give access for oiling, turning over the flywheel, etc., are not considered openings.

b. For flywheels five (5) feet or less in diameter, the following may be used:

   A disc attached to the wheel in such a manner as will protect the spokes of the wheel on the exposed side and present a smooth surface. An open space not exceeding two and one-half (2½) inches in width may be left between the outside edge of the disc and the rim of the wheel, if desired, to facilitate turning the wheel over. Where a disc is used, any keys or other dangerous projections not covered by the disc shall be cut off or covered.

   EXCEPTION: Solid, well-type flywheel which is provided with hand holds for adjusting machinery.

CONCRETE MIXERS

Section 9. All mixers with skips having a capacity of three-fourths (¾) cubic yard or more, shall be provided with guard rails on both sides of the skip pan extending the full length of the pan. Guard rails shall be constructed of substantial materials and shall be not less than thirty-six (36) inches nor more than forty-two (42) inches in height above the ground.

Section 10. Where guard rails are of a type having a chain or rod connecting the side rails, and depression springs in the rails which cause the

guard rails to be depressed as the pan descends and automatically to be raised as the pan ascends, such chain or rod shall not be removed, but shall be kept in place while the mixer or skip is in operation.

Section 11. Where cement is taken from an elevated bin, hopper or similar structure by a chute in an enclosed space, employees working therein shall be furnished with suitable eye protection and respirators and it shall be the responsibility of the employee to wear the protection provided which will effectively remove the hazards to health by the inhalation of dust arising therefrom.

Section 12. Guard rails shall not be tied up nor otherwise fastened to the mixer in such manner as will expose employees to contact with the skip when in operation. Broken guard rails shall be immediately replaced and damaged guard rails immediately repaired.

Section 13. Chutes and spouts for transporting concrete shall be supported and designed to withstand a live load of not less than 250 pounds per running foot and wind pressure calculated on a basis of twenty (20) pounds per square foot and all parts exposed to wear or deterioration shall be inspected at least once each week and after each moving or changing of chutes.

Section 14. The moving parts of the traveling bucket boom when not elevated seven (7) feet or more above the ground level shall be guarded.

CRANES - BUCKETS

Section 15. Concrete buckets positioned by crane or overhead cableway shall be suspended from deep-throated hooks, equipped with a swivel and safety latch. A signalman shall be posted in clear view of the receiving area and the crane operator.

POWER CRANES AND SHOVELS

Section 16. Every power-driven crane or shovel shall be provided with a cab, screen or other suitable means to protect the operator in case a cable should break or material fall from the dipper or bucket.

Section 17. All cranes and shovels, including cranes with friction brakes and those not in direct drive, when not in use, shall be left with the dipper or bucket on the ground or on a substantial support.

Section 18. All oiling and greasing of equipment shall be done when the master clutch is disengaged.

Section 19. Operators shall not be permitted to leave the cab while the master clutch is engaged.

Section 20. All wiring and electrical apparatus used on electric cranes or shovels shall be installed, equipped and maintained according to the code governing such equipment, as provided in the current editions of the National Electrical Code and the National Electrical Safety Code.

Section 21. Temporary wiring shall be properly insulated and grounded to minimize the danger of shock.

Section 22. All hoist drum brakes of shovels or cranes shall be tested without load prior to the start of daily operations or following any stoppage due to weather conditions.

Section 23. A permanently attached instruction plate giving the manufacturer's permissible work loads at designated radii shall be provided in the cab of every shovel or crane. Any alteration of the boom or boom parts of the manufacturer's equipment shall be recalculated and posted giving permissible work loads.

STEAM POWERED

Section 24. Where steam is used as the driving power, steam boilers shall be installed, equipped and maintained as provided in the Montana State Boiler Code.

Section 25. Steam pipe exposed to contact shall be insulated to protect workmen from burns.

Section 26. Before starting, the drip cocks in the pipes leading from the boiler to the engine shall be open and the cylinders and pipes drained.

Section 27. Drains and blow-offs shall discharge under the shovel or the discharge pipe shall be shielded to protect persons passing or working near the shovel or crane.

Section 28. Every boiler shall be provided with safety valves, gauge cock and steam pressure gauge.

COMPRESSED AIR POWERED

Section 29. Where compressed air is used as a driving power, the compressor, air receiver and other parts of the compressed air equipment shall be installed, equipped and maintained in compliance with the Montana Code on Unfired Pressure Vessels. Every compressor shall be provided with approved safety devices, including a safety valve and pressure gauge.

HEAVY EQUIPMENT

Section 30. Only active, able-bodied, trained and qualified men shall be

assigned as operators of earth moving equipment. They shall be instructed in the hazards connected with their work and shown safe methods of operation.

Section 31. The operator shall never leave his machine on an inclined surface with the motor idling.

Section 32. Operators shall always check to make certain that other workmen are in the clear before initial starting of the machine.

Section 33. Unauthorized riding on equipment shall be prohibited.

Section 34. Employees shall not jump on or off machines in motion, nor should persons attempt to direct traffic while they are operating equipment.

Section 35. Before repairs are made on earth moving equipment, the operator shall make certain that motor is not running. The motors of all equipment shall be stopped before refueling.

Section 36. The operator shall keep deck plates or steps on equipment free of grease, oil, ice, or mud.

Section 37. Suitable gloves shall be worn when handling wire rope. Hands shall be kept away from sheaves and other working parts.

Section 38. The operator shall set the brakes, land the blade, and put the shift lever in neutral before he leaves the bulldozer at the end of the work shift.

Section 39. When equipment is secured at the end of the working shift, dozer blades, scrapers, buckets, clams or dippers shall be resting on the ground.

Section 40. Before moving earth moving equipment, the operator shall make certain that no one is in the "Danger Zone" around the equipment.

Section 41. Only the operator shall be on the operating platform or seat while the machine is in use. The operator shall not allow anyone to ride on the drawbar of the tractor or bulldozer.

Section 42. It is recommended that employers arrange shifts so that no employee shall be required to work alone at any time unless he is in close contact with other employees.

Section 43. Earth moving equipment shall be maintained on a regular schedule. Maintenance shall include regular inspection of brakes, steering gear and tires so that the machinery is kept in safe operating condition.

Section 44. All earth moving equipment shall be stopped and brought to a complete standstill before any repairs or adjustments are made or pieces of

material or refuse removed, except where motion is necessary to make adjustment.

Section 45. Bulldozers used on clearing work shall be fitted with heavy, well supported, arched, solid steel topped canopies to protect the operator. Tractors, heavy earth moving scrapers and similar earth moving equipment shall also be provided with a substantial overhead guard to protect the operator from falling objects where such hazards exist. Construction of canopies shall be the minimums as recommended by the U. S. Army Corps of Engineers.

Section 46. Fenders shall at all times be maintained on all self-propelled earth moving equipment which is originally equipped with such fenders.

Section 47. Exhaust stacks of heavy dirt moving machinery shall at all times be maintained in proper working order and length to insure the operator of having the fullest protection from inhaling exhaust fumes.

Section 48. Workmen making repairs or adjustments shall tag the main disconnecting device, warning that the machine shall not be started. The said tag shall not be removed by any person other than the one who attached it.

CONVEYORS AND CABLEWAYS

BELT CONVEYORS

Section 49. Belt conveyors shall not be overloaded to the point where materials are likely to fall off the belt.

Section 50. The walkway along the belt shall be kept free of materials. Where the walkway is three feet or more above the ground, a standard guard rail shall be installed.

Section 51. Riding a conveyor belt shall be strictly prohibited.

LUBRICATION

Section 52. Adequate facilities shall be provided for routine lubrication, maintenance and inspection.

Section 53. Oilers shall never attempt to service rollers while the belt is in motion. All oil or grease fittings shall be so located that the oiler can service the fittings without exposing himself to danger.

AERIAL CABLEWAYS

Section 54. Riding bucket and loads shall be prohibited.

Section 55. No work shall be carried on directly beneath the tramway,

except at the loading and unloading stations, where every precaution shall be taken to protect workers. Equipment shall be regularly and frequently inspected, with special attention given to anchors, sheave wheels and bearings, wire rope fastenings, the bucket latch and trunnions, and all load carrying parts.

Section 56. Wire ropes shall be kept well lubricated, and inspected at least twice weekly. Special care shall be taken in the inspection of the button line at the buttons, where all grease should be removed and the cable examined for broken wires and abrasions.

Section 57. Rubber and steel ferrules shall be installed on each end of the buttons as shock absorbers.

LIGHTING

Section 58. For night operations, clearance lights shall be installed on high points under the cableway to assist the operator in maintaining proper clearance over such points. Loading and unloading stations shall be adequately lighted.

(Reference: B 20-1, Safety Code for Conveyors, Cableways and Related Equipment, ASME.)

MISCELLANEOUS CONSTRUCTION EQUIPMENT

Section 59. Only mineral oil having a high flash point shall be used for lubricating air compressors.

Section 60. When gasoline is being pumped into the storage tank of any construction machinery, the engine shall be shut down.

Section 61. The boom or any type of material handling equipment such as bucket, dipper, clamshell, etc., of a power shovel or crane shall not be passed over the seat or cab of a truck or other transporting equipment while any employee is in the cab.

NOTE: Loading from the side or rear shall not be construed as passing over the seat or cab.

Section 62. Only experienced and physically fit drivers shall be allowed to operate automobile trucks.

a. Brakes, steering gear, tires and all operating parts of trucks shall be inspected daily; such inspections should, preferably, be made before trucks are taken from the garage or storage area for the day's work.

b. All employees shall be strictly prohibited from:
   1. Riding on trucks unless specifically authorized to do so.
   2. Riding anywhere on a truck except in the seat beside the driver, unless the truck body is equipped with fixed-in-place seats, a rear gate, and a safe means of getting on and off.
   3. Getting on or off moving vehicles.

c. Truck engines shall never be allowed to run idle in closed garages or other enclosed places.

d. All parts and accesories of trucks shall be kept in good repair and safe condition. Trucks with broken or cracked parts or defective tires shall be removed from service until the defects have been corrected.

e. On material which projects beyond the rear end of any truck using a public highway there shall be tied or fastened to the projecting end of the material:
   1. A red flag during the daylight hours.
   2. A red light during the hours of darkness.

f. No person shall be permitted to remain on a truck when it is being loaded by a power shovel or to remain within reach of the swing of the dipper.

g. Material shall never be loaded on a truck so as to project horizontally beyond the sides of the body nor so that it can be jarred off due to vibration during transit.

h. Trucks while being loaded shall be properly blocked where there is a possibility of their moving by gravity, vibration from blasts, or other causes.

i. Loads not fully contained within the body of the truck shall be secured by means of chains, cables, ropes, or other effective devices.

j. The backing up of trucks shall be controlled by a signal man who shall have a clear view of the driver and the area behind the truck during each backing-up operation.

k. Completely deflated tires on trucks shall never be inflated until after the load has been removed and then only by jacking up the truck. Truck drivers and mechanics shall be instructed in this procedure.

l. Dump bodies shall be equipped with a mechanical device attached to the frame of the truck to block body when in a raised

position, **or the box shall be adequately blocked by a square timber of sufficient size to support the box, laid across both members of the truck frame,** except that all such trucks in use at the time of the adoption of this provision shall be adequately blocked or cribbed when in a raised position for the purpose of greasing, inspecting or repairing.

HAND TOOLS

Section 63. Tools shall be of safe design and construction and suited to the purpose for which they are used.

Section 64. All tools shall be kept in good condition and shall be restricted to the use for which they are intended.

Section 65. Handles shall be securely attached to tools, and shall be of firm straight grained handle stock. Tools with defective handles shall be immediately repaired or removed from the job.

Section 66. Mushroomed or crystallized iron wedges, chisels, punches, hammers and similar equipment shall be replaced or properly repaired. Exceptionally hard hammers, wedges and similar tools shall be removed from service.

Section 67. When any tools used for striking or to be struck by other tools show a tendency to chip or crack they shall be immediately discarded.

Section 68. If it is necessary to weld or braze a tool it should be done only by a person qualified to perform such work and acquainted with the various compositions of tool steel.

Section 69. Crowbars, cold chisels, saws, peavies, screwdrivers and keen-edged tools should be kept in safe condition, well dressed or sharp.

POWER-OPERATED WOODWORKING MACHINERY

PNEUMATIC AND PORTABLE TOOLS

WOODWORKING MACHINERY

Section 70. All power-operated woodworking equipment, unless otherwise specified, shall be guarded in the manner set forth in the Specific Requirements Covering the Operation of Woodworking Machinery and shall have their belts, pulleys, gears, drives, etc., guarded as set forth in Sections 1 to 6, Chapter II, inclusive, and Section 86, Chapter II. This section shall not apply to lock and butt mortising machines.

Section 71. Horizontal travel, convertible, power-driven saws, with stands and with the saw suspended from a horizontal travel-arm attached to a vertical standard, shall be equipped with guards above the axis of the saw which will completely protect the operator from contact therewith when in operation and with guards below the axis of the saw which will automatically adjust themselves to the work when in use, so that none of the teeth are exposed to contact above the work and when withdrawn shall completely cover the saw to the depth of the teeth. When used in ripping operation a spreader shall be provided, attached to the guard or securely fastened behind the saw to prevent pinching or binding. When dado or other special operations are performed which do not permit the above method of guarding, a jig, fixture or other device shall be provided which will remove the hands of the operator from the points of operation.

Section 72. All portable electrically-driven saws and drills shall be grounded.

PORTABLE CIRCULAR SAWS

Section 73.

a. All portable circular power saws used on construction operations shall be equipped with hold-down trigger switch and shall be effectively grounded when in use.

b. Portable power-driven circular saws shall be so guarded that the saw is entirely enclosed when not in the cut. Saws of this character shall not be used in an overhead position.

FIXED CIRCULAR POWER SAWS

Section 74.

a. Circular saws shall be substantially guarded. When the saw is not in use the guard shall rest on the table, completely covering the saw. The guard shall automatically rise by pressure of material, or otherwise, to receive the material to be cut, adjusting itself to the thickness.

b. Dado or other special operations performed on variety or miter saws which do not permit the method of guarding as above specified, shall be performed by the use of a jig or fixture which will prevent the hands of the operator from coming in contact with the cutting parts at the point of operation.

c. Guards shall be constructed and equipped so as to prevent material caught by the saw from being thrown back upon the opera-

tor. All ripsaws, except with two or more power rolls, shall be provided with a spreader attached to the guard or securely fastened behind the saw to prevent pinching or binding.

d. Defective circular saws shall be replaced. Cracked circular saws shall be deemed to be defective.

e. It shall be the responsibility of the operating employee to see that all guards are in their proper positions at all times.

OTHER TYPES OF MACHINERY

Section 75. All power-operated metal working machines shall have their belts, pulleys, gears and drives guarded as set forth in Sections 1 to 6, Chapter II, inclusive.

Section 76. All pneumatic machines operating reciprocating tools such as hammers, riveters, caulkers, etc., shall be constructed or equipped with devices to hold the piston and tool in the machine to prevent them from being "shot out." Where the nature of the work requires a tool that precludes the preceding requirement, then only hammers with inside triggers shall be used. Pneumatic or power driven drills, saws, and other hand tools shall be assigned only to employees who have been given thorough instructions as to their safe use and care.

Section 77. Bench grinders shall be equipped with eye shields. Stone shall be inspected regularly, and if found defective, it shall be discarded.

POWDER-ACTUATED DRIVERS OR FASTENERS

DEFINITIONS

Section 78.

a. Power Load: Means any substance in any form capable of producing a propellant force.

b. Powder Actuated Fastening Tool: Means a tool or machine which, by means of a power load, propels or discharges a stud, pin or fastener for the purpose of impinging it upon, affixing it to, or penetrating another object or material.

c. Tool: Means a powder-actuated fastening tool, unless otherwise indicated and shall include all accessories pertaining thereto.

d. Piston Tool—Low Velocity Type: Means a tool that utilizes a piston to drive a stud, pin or fastener into a work surface and is so designed that when used with any commercially available power

load that will chamber in the tool and a proper stud, pin or fastener it will not cause such stud, pin or fastener to have a velocity in excess of 300 feet per second when measured 6.5 feet from the muzzle end of the barrel. (NOTE: This measurement is obtained by use of accepted ballistic test methods.)

e. Protective Shield or Guard: Means a device or guard attached to the muzzle end of the tool which is designed to confine flying particles.

f. Stud, Pin or Fastener: Means a fastening device specially designed and manufactured for use in tools.

g. Unapproved Tool: Means a tool not approved or one which materially differs from an approved tool whether by reason of manufacture, alteration, excessive wear, damage or other cause.

QUALIFIED OPERATOR

Section 79.

a. **Training and Testing**

1. The operator shall be able to clean the tool correctly and to recognize any worn or defective parts or defective operation. He must also be able to use the tool safely under varying conditions and know the limitations of its use. He must be familiar with the provisions of this code and instructions provided by the manufacturer for operation and care.

APPROVALS

Section 80.

a. **Approvals Required** (*)

1. Only approved tools shall be used or kept for use. No unapproved tool shall be kept for use, and no person shall use an unapproved tool or shall cause or permit an unapproved tool to be used. (**)

(*) Exceptions shall be made in the case of tools in the design or development stage, in which case such tools may be used by selected personnel properly trained by the manufacturer.

(**) Approval is understood to mean that of the Powder Actuated Tool Manufacturers Association.

b. **Numbering**

1. Each approved tool shall legibly bear some permanent indica-

tion as to its model number, which shall serve as a means of identification for checking approved tools.

DESIGN REQUIREMENTS

Section 81. Tools (except piston tools—low velocity type) submitted for approval shall have characteristics outlined below and, in the discretion of the manufacturer, any additional safety features he may wish to incorporate.

a. **Protective Shield or Guard**

1. The muzzle end of the tool shall at all times have a protective shield or guard at least three and one-half inches in diameter, mounted perpendicularly to the barrel and designed to confine any flying particles or fragments that might otherwise create a hazard at the time of firing.

2. Where a standard shield or guard cannot be used, or where it does not cover all apparent avenues through which flying particles might escape, a special shield or guard, fixture or jig, designed and built by the manufacturer of the tool being used, which provides this degree of protection, shall be used as a substitute.

b. **Firing Mechanism**

1. The firing mechanism shall be so designed that the tool cannot be fired during loading or preparation to fire or if the tool is dropped while loaded.

   Firing of the tool shall be dependent upon at least two separate and distinct operations of the operator, with the final firing movement being separate from the operation of bringing the tool into the firing position.

2. The tool shall be so designed as not to be operable other than against a work surface and unless the operator is holding the tool against the work surface with a force of at least five (5) pounds greater than the total weight of the tool.

3. The tool shall be so designed that it will not operate when equipped with the standard guard indexed to the center position, if the bearing surface of the guard is tilted more than eight (8) degrees from contact with the work surface.

c. **Variable Power**

The tool shall be so designed that positive means of varying the power are available or can be made available to the operator as

part of the tool, or as an auxiliary, in order to make it possible for the operator to select a power level adequate to perform the desired work without excessive force.

d. **Inspection**

The tool shall be so designed that all breeching parts will be reasonably visible to allow a check for any foreign matter that may be present.

e. **Construction**

The tool shall be so designed that all parts of the tool will be of adequate strength to resist maximum stresses expected upon firing when using any commercially available power load which will chamber in the tool.

SERVICING

Section 82.

a. The tool shall be tested each day before loading to see that safety devices are in proper working condition.

b. Method of testing shall be in accordance with the manufacturer's recommended procedure.

c. Any tool found not in proper working order shall be immediately removed from service and not used until proper repairs are made. The owner of the tool must have it serviced and inspected at regular intervals by competent service personnel and must not permit it to be altered or repaired except by competent repairmen.

LIMITATIONS OF USE

Section 83.

a. **Materials**

Fasteners shall not be driven into very hard or brittle materials including but not limited to cast iron, glazed tile, surface hardened steel, glass block, live rock, face brick or hollow tile.

b. **Piercing of Materials**

Driving into soft materials shall be avoided unless they are backed by a substance that will prevent the pin or fastener from passing completely through and creating a flying hazard on the other side.

c. **Distance from Edge of Materials**

Fasteners shall not be driven directly into materials such as brick or concrete closer than three (3) inches from the unsupported edge or corner, or into steel surfaces closer than one-half (½) inch from the unsupported edge or corner, unless a special guard, fixture or jig is used.

When fastening other material such as a 2"x4" wood section to a concrete surface, it is permissible to drive a fastener of no greater than 7/32" shank diameter not closer than 2" from the unsupported edge or corner of the work surface.

d. **Pre-Drilled Holes**

Fasteners shall not be driven through existing holes unless a positive guide is used to secure accurate alignment.

e. **Spalling**

No fastening shall be attempted into a spalled area caused by an unsatisfactory fastening.

f. **Explosive Atmosphere**

Tools shall not be used in an explosive or flammable atmosphere.

TOOL HANDLING

Section 84.

a. **Safety Goggles**

No operator shall use a tool unless he is wearing safety goggles or safety glasses of an approved type.

b. **Inspection**

Before using a tool the operator shall inspect it to determine to his satisfaction that it is clean, that all moving parts operate freely and that the barrel is free from obstructions.

c. **Defect During Use**

When a tool develops a defect during use, the operator shall immediately cease to use and contact competent service personnel to make whatever repairs may be necessary.

d. **Tool Handling**

Tools shall not be loaded until just prior to the intended firing time. Neither empty nor loaded tools are to be pointed at any

workmen or other persons, and hands should be kept clear of open barrel end.

e. **Loading**

No tool shall be loaded unless being prepared for immediate use, nor shall an unattended tool be left loaded.

f. **Misfires**

In case of a misfire, the operator shall hold the tool in the operating position for at least fifteen (15) seconds and shall continue to hold the muzzle against the work surface during disassembly or opening of the tool and removal of the power load.

g. **Safeguarding and Storage**

A tool shall never be left unattended in a place where it would be available to unauthorized persons.

POWER LOADS

Section 85.

a. **Identification**

A standard means of identifying the force of power load charges contained in the various cartridges to be used in tools shall be used. Such means of identification shall be a uniform color system as follows:

COLORS	CHARGES
Brown	Extra Light
Green	Light
Yellow	Medium
Red	Heavy
Purple	Extra Heavy
Black	Magnum

Colors shall be strikingly printed on the cartridge container and color identification shall be further placed on the cartridge or wadding of each cartridge and shall provide a color indication of the powder charge contained therein.

b. **Optional Identification**

Where means other than the size of charge in power load charges are to be used to control the penetration, an identification method acceptable to the Montana Industrial Accident Board, Department of Safety, shall be used.

OTHER MACHINERY GUARDING

Section 86. All moving, revolving or reciprocating parts of machines, machinery or equipment used and operated in connection with building and construction work, that present a hazard to workmen during their employment and not specifically mentioned in Section 1 to 85, Chapter II, inclusive, shall be guarded in accordance with the orders of The Industrial Accident Board Department of Safety. The foregoing provisions shall not apply to concrete skips, power shovel buckets, booms of derricks or similar equipment.

CHAPTER III

DEMOLITION

PLANNING THE WORK

Section 1. Before beginning the actual work of demolition, a careful study shall be made of the structure that is to be torn down. and of its surroundings. A DEFINITE PLAN OF PROCEDURE THEN SHALL BE MAPPED OUT, AND THEREAFTER FOLLOWED AS CLOSELY AS POSSIBLE.

SHORING ADJOINING BUILDINGS

Section 2.

a. Shoring of other buildings is often necessary and full provision shall be made for carrying out all operations of this kind promptly, thoroughly and in a safe and workmanlike manner. The removal of a building may weaken the side wall of adjoining structures, and to prevent possible damage, the demolition contractor shall support these walls until such time as permanent protection is provided.

b. If a structure has been partly wrecked by fire, flood or explosion, or other catastrophe, it may be necessary to shore up or brace some of the walls of the building that are to be taken down, before the wrecking operations can be safely started.

PROTECTION OF THE PUBLIC

Section 3.

a. Before the wrecking operations begin, protection of the public against falling objects shall be provided when the buildings stand close to a street or to a much frequented thoroughfare of any kind.

The entire sidewalk adjoining the building to be wrecked shall be fenced off, and sidewalk sheds constructed where necessary. Sidewalk sheds shall be capable of supporting a load of 150 pounds per square foot. If material is to be piled on sheds, they shall be capable of supporting 300 pounds per square foot. (See "Typical Detail of Sidewalk Protective Shed Affording Protection to the Public," Figure 20, Appendix.)

b. Platforms and guard rails shall be erected for the protection of the public and workmen from danger. (See local ordinance.)

c. Warning signs and red lights at night shall be placed wherever the public is exposed to any danger.

d. Where building material is to be disposed of, and where it is to be removed by members of the public directly from the site, special precautions are necessary to keep them clear of the danger zone.

ORDER OF PROCEDURE

Section 4.

a. The demolition shall always proceed systematically, story by story, and the work on the upper floors shall be completed before any of the supporting members or other important parts of the lower floors are disturbed.

b. All gas, electricity and water shall be shut off at the outset, and all windows, glass doors and other fragile fixtures removed before proceeding with any other work. The lath and plaster then shall be stripped off throughout the entire building to eliminate a large amount of dust-producing material before the more substantial parts of the building are removed.

REMOVING MATERIAL FROM UPPER FLOORS

Section 5. Wrecked material and debris shall not be thrown to the ground or from floor to floor if it creates a hazard to other workmen or the passing public unless the area, including boundary wall openings, is closed off. Such material shall be lowered to the ground or to the top of the sidewalk shed by means of ropes or suitable tackle.

MATERIAL CHUTES

Section 6.

a. Metal or wooden chutes shall be provided, in all cases, for the removal of bricks and other loose debris. They shall be completely

enclosed so that it will be impossible for the material to escape before reaching the bottom. To prevent the descending material from attaining a dangerous speed, chutes shall not extend in an unbroken line for more than two stories. A gate or stop provided with suitable means for closing shall be placed at the bottom of each chute to stop the flow of material.

b. Workmen shall not be allowed to remove material from chutes with their hands. Suitable tools shall be provided for that purpose.

c. A danger sign and removable barricades shall be placed at the discharge end of every chute, and workmen or other persons shall not be allowed to stand near or to leave trucks near, except while loading. Flashboards of extra height to prevent material from bounding shall be placed on vehicles that are to be loaded from a chute.

REMOVING WALLS IN SECTIONS

Section 7.

a. Sections of walls shall never be loosened and allowed to fall as single masses upon the floors of buildings that are being demolished.

b. Floors shall not be overloaded by letting accumulated material down from floor to floor. Debris shall be chuted down and hauled away immediately.

c. Walls shall be removed part by part. If so thin or weak as to make it dangerous to stand on them, staging shall be erected for the men to work on.

d. Chimneys and walls as a general rule shall not be pulled down as a whole.

e. Chimneys and walls shall not be left in such condition that they may be toppled by wind, built-in beams or other force.

REMOVING STRUCTURAL STEEL

Section 8.

a. Where a derrick is used, care shall be taken to see that the floor on which it is placed is amply strong for the loading to be imposed. If necessary, heavy planking shall be used to distribute the load to floor beams and girders.

b. Overloading of the equipment shall be guarded against.

c. Tag lines shall be used on all lowered or hoisted material and a proper signal system set up and used.

d. Men shall not be permitted to ride the load or the load line except where an extraordinary emergency exists, or, where it is known to be the safest method to reach places difficult and dangerous of access by other means, permission for men to ride hook or material hoist may be granted by the Montana Industrial Accident Board.

e. Dropping of structural steel will be allowed provided the public and workmen are excluded and barricaded out of the area.

MECHANICAL DEMOLITION

Section 9. When demolition is to be performed by a weight ball, power shovel, or other mechanical device, the following precautions shall be taken:

a. The area shall be barricaded a minimum distance from the wall of one and one-half the height of wall.

b. Only workmen engaged in demolition shall be allowed in this area.

c. While the mechanical device is in operation, no workmen shall be allowed to enter the building being demolished.

d. The device being used shall be located to avoid falling debris.

e. Where a swinging weight is being used, the cables shall be of such length or so restrained that the weight cannot strike any other structure, power line, etc.

f. Two or more separate cable slings shall be used through a deep-throated safety latch and swivel to attach the weight ball to the crane hook.

g. Operators shall let the weight rest on or touch the point to be struck before placing the weight in operation.

MISCELLANEOUS

Section 10.

a. In demolishing exterior walls of a multi-story structure, "catch platforms" of heavy planking shall be provided to prevent injury to men working below and to the public. The outer edge shall be at least six inches higher than the inner edge. An enclosure of

heavy galvanized iron wire mesh shall be provided along the outer edge of the catch platform.

b. Care shall be exercised in handling sheet metal roofing and cornices, and no broken glass shall be left lying about in the building.

c. Stairs and stair railing shall be left in place as long as possible.

d. Material shall not be allowed to accumulate on a floor so as to overload it.

e. Hoists or elevators shall not be overloaded.

f. Scaffold used on walls shall be self-supporting, especially on a burned building.

g. Scaffolds built outside the walls on outriggers shall not be used on demolition work.

h. Special care shall be exercised where beams are embedded in party walls.

i. Goggles shall be worn to protect the eyes from injury from flying pieces, dirt and dust blown by the wind.

j. Gloves shall be worn.

k. Men exposed to the danger of falling objects shall wear hard hats.

l. Screens shall be placed where necessary to prevent flying pieces from injuring fellow workmen.

m. Water shall be used to reduce dust when tearing down plaster or brick work. If watering is impractical, workmen shall wear approved type respirators.

n. No unnecessary work shall go on below, but when necessary work is required, those so employed shall be protected.

o. A flashlight or electrically actuated lamp shall be used when walking through dark or unlighted halls or other areas.

THE NAIL HAZARD

Section 11.

a. All projecting nails in boards, planks and timber shall be carefully removed, hammered in or bent in a safe way when material is to be salvaged.

b. Gloves, hard hats, and safety shoes with good soles shall be worn by workmen engaged in demolition work.

CHAPTER IV

EXCAVATIONS, SHAFTS, TUNNELS

DEFINITIONS

Section 1.

a. The words or expression "angle of repose" when used in this code means the greatest angle above the horizontal plane at which a material will lie without slipping.

b. The word "excavation" when used as a noun in this code means a cavity, opening or cut formed in the earth by breaking and/or loosening and/or cutting and/or digging and/or scooping and/or pushing aside and removing therefrom the soil, rock or other material necessary for the formation of the cavity, opening or cut.

c. The word or expression "hard compact materials" when used in this code means soils, exclusive of rock, which in their unfrozen state are uniformly close grained, dense, compact, hard, relatively dry, although they may be moist, cohesive to the extent that in the exposed faces of an excavation they are not subject to cracking, flaking or spalling and/or do not otherwise manifest instability, except on exposure unsupported for more than 24 hours and which are relatively free from decomposed or partially decomposed vegetable matter.

d. The word "rock" when used as a material means the solid ledge or hard slag which is to be, is being or has been loosened and broken for excavation or removal by drilling, blasting, channeling, wedging or barring.

e. The word "shaft" when used in this code in connection with tunnel work means an excavation made from the surface of the ground, the longer axis of which forms an angle with the vertical of not more than 45 degrees.

f. The word "shale" means compacted muds or clays which possess a more or less thinly laminated or fissile structure along which they may be easily cleaved.

g. The word "trench" when used as a noun in this code means an excavation extending downward from the surface of the ground, a horizontal section of which at any elevation is approximately rectangular in shape, the maximum width of which is not more

than 20 feet, the depth of which is not more than 30 feet and the length of which is considerably greater than the width.

h. The word "tunnel" when used as a noun in this code means a subterranean passageway built without the removal of the overhead material.

i. The expression "tunnel excavation" when used in this code means a subterranean excavation made without the removal of the overhead material.

j. The expression "tunnel heading" when used in this code means the entire length of tunnel extending from the shaft to the working face, or where headings from two shafts have advanced to the point of junction; it means the entire length of tunnel from shaft to shaft.

k. The word "underground" when used in this code in connection with tunnel work means within the limits of any shaft or tunnel heading.

l. The expression "working face" when used in this code in connection with work underground means the transverse face of the tunnel heading at the point of greatest advancement of the tunnel excavation.

EXCAVATION

Section 2. The sides of every excavation four (4) feet or more in depth, where there is danger of slides or cave-ins, shall be supported by substantially braced sheet piling or shoring unless the sides of the excavation are sloped to the angle of repose of the material being excavated. Such bracing system shall be designed to resist all loads which it might reasonably be expected to support, including not only those resulting from the weight of the soil or other material itself, but also those resulting from all transportation facilities, surface and/or sub-surface structures, stored materials, stored or operating construction machinery or equipment and/or previous excavations and shall be constructed of such material, of such strength as to conform with the requirements of Section 6 or 7 and Section 8, Chapter I. Should other load producing conditions prevail, the bracing system shall be provided with such additional and/or stronger members as may be necessary.

Section 3. In excavations where the sides are sloped to an angle equal to or less than the angle of repose of the material being excavated and where such sloping of the sides extends to less than the full depth of the excavation, the sides of such excavations below such sloped sides shall be supported

by a bracing system conforming to the requirements of Section 2, 7 and 8, Chapter IV, and in determining the details of the bracing system so required, the depth of the excavation shall be taken as the depth from the foot of such sloped sides to the bottom of the trench. The vertical planks in the bracing system shall, however, extend to an elevation at least one foot above the foot of such sloped sides and ten (10) inch toe boards of nominal two (2) inch thickness shall be placed behind them except where the vertical planks abut each other.

Section 4. Unless other means are permitted in this code, ladders or stairways readily accessible shall be provided for workmen to go into and out of all excavations and/or to and from platforms or other working areas. Landing platforms shall be constructed not more than 30 feet apart vertically. In trenches, ladders shall be available at not more than fifty (50) feet intervals.

Section 5. Excavated or other material shall be stored in such a manner that the material cannot fall into the excavation but in no case shall the material be closer than eighteen (18) inches from the top edge of the excavation.

Section 6. Undercutting of the sides of excavations, described in Section 1, Chapter IV, is prohibited unless the exposed faces of such undercutting are supported as outlined in the aforementioned section.

BRACING SYSTEMS

ERECTION AND MAINTENANCE OF BRACING SYSTEMS

Section 7. The erection of the bracing system shall be carried along simultaneously with the excavation. At no time shall the sides or exposed faces of any excavation be unsupported. All bracing shall be bolted or nailed.

A temporary bracing system may be provided for a vertical distance of not more than five (5) feet but only for such time as is necessary to permit erection of the required bracing system.

a. The bracing system shall be erected and maintained in such manner as to bear directly and firmly against the sides or exposed faces of the excavation and support the entire load at all times.

b. If at any time voids should form in the sides or exposed faces of the excavation back of the bracing system such voids shall be filled promptly with selected material removed from the excavation or with similar material, which shall be compacted by thorough tamping. Blocking with plates and wedges or other means may be used in lieu of filling, provided the blocking is erected in such manner as to cause the load to be applied continuously

throughout the length of the bracing system. The formation of such voids is to be interpreted as constituting notice to the employer of possible weakening and/or insufficiency of the bracing system in the immediate vicinity of such voids and he shall immediately inspect and correct the bracing system.

c. In lieu of cross bracing specified in Sections 10 and 11, Chapter IV, approved screw jacks or other mechanical braces of equivalent strength may be used as cross braces when properly anchored in trenches of forty-two (42) inches or less in width.

Section 8. The employer or his authorized representative shall in addition to the inspections hereinbefore specified make a thorough inspection of said bracing system within the area where employees are working, at least once each working day. If such inspections reveal, or if otherwise observed, any weakness of the same as evidenced by the displacing, bending, twisting, cracking, splitting or crushing of any one or more of the members or any movement of the sides of the excavation, he shall immediately replace, repair or otherwise strengthen such weakened member or members and/or provide sufficient additional members in the bracing system to prevent further movement of the sides of the excavation.

In all excavations made in rock, the employer or his authorized representative shall make inspections at least once daily of the sides or exposed faces of the excavation for loose, disintegrated or shattered rock and if and when such rock is found in such inspections or is otherwise observed, he shall immediately cause it to be removed from the sides or exposed faces of the excavation.

a. A competent person shall be held responsible for frequent inspection of shoring, and each workman shall be instructed to report at once any indication of weakness.

b. Care shall be taken to see that sole pieces of shoring are on solid ground.

c. On diagonal bracing it is very important that adequate bearing is provided at the lower end to resist the thrust of the bank above.

d. Shoring and walls shall be protected against damage from swinging loads being hoisted.

e. Special precaution shall be taken to guard against damage from vibration of machinery in motion in adjoining buildings.

f. Jacks shall be inspected and known to be of sufficient strength for the load they are to carry before being placed in position, and

workmen shall be cautioned when using screw jacks to avoid the bar slipping and throwing them. The load shall be properly centered so the jack will not kick out.

g. Workmen shall not be allowed to work under an object supported by jacks alone. Blocking shall be carried forward with jacking in order to minimize hazards due to failure or slipping of jacks.

h. One responsible person shall at all times be stationed on ground above such excavations, when there are workmen in the excavation.

i. All workmen engaged in bracing, shoring or trenching operations shall wear approved type hard hats.

BRACING SYSTEM IN ROCK

Section 9. The sides or exposed faces of excavations made in rock may be unsupported except when the following conditions prevail, in which case the requirements of Section 2, Chapter IV, of this code must be followed unless the sides are sloped at not more than 30 degrees with the horizontal:

a. The sides or exposed faces are composed of loose, shattered, faulted or disintegrated rock and/or pockets of clay or other soil, any or all of which are of such nature as may endanger workmen in or near the excavation.

b. The rock is seamed and such seams lie at an angle of 30 degrees or more with the horizontal and are filled with clay or other material upon which the rock might slide.

c. In shale excavations, if within the duration of the work the shale tends to disintegrate.

Section 10. The sides of all trenches in hard, compact materials and of depths greater than five (5) feet, where there is danger of slides or cave-ins, shall be supported by a bracing system, as follows:

TRENCHES IN HARD COMPACT SOIL

5 TO 20 FEET IN DEPTH

UPRIGHTS—

2" x 8" plank spaced approximately 8' c to c.
Top of plank even with top of excavation; bottom not more than 2' above bottom of trench.

STRINGERS—

2" x 10" plank placed under upright with center line of plank 12" below top of trench.

CROSS BRACES—

4" x 4" timbers for trenches up to 6' in width.
6" x 6" timbers for trenches 6' to 12' in width.
8" x 8" timbers for trenches 12' to 20' in width.
First horizontal transverse brace not more than 3' below top of trench. All others 5' or major fraction thereof for depth of trench.

OVER 20 FEET IN DEPTH

UPRIGHTS—

2" x 8" plank spaced approximately 4' c to c.
Top of plank even with top of excavation; bottom not more than 2' above bottom of trench.

STRINGERS—

To be same dimensions as required for horizontal transverse braces and spaced not more than 5' c to c with top stringer not more than 3' from top of trench, braced vertically by not less than 4" x 4" timbers, one at each side of trench at each cross brace.

CROSS BRACES—

4" x 4" timbers for trenches up to 6' in width placed 8' c to c.
6" x 6" timbers for trenches 6' to 12' in width placed 8' c to c.
8" x 8" timbers for trenches 12' to 20' in width placed 8' c to c.

BRACING SYSTEM IN OTHER SOILS

Section 11. The sides of all trenches in other than hard, compact material or rock which would include saturated or partially saturated, filled or unstable soils, quicksand, loose gravel, loose sand and loose shale, and of depths greater than 5 feet shall be supported by a bracing system, as follows:

TRENCHES IN ALL OTHER MATERIAL

5 TO 20 FEET IN DEPTH

UPRIGHTS—

2" plank close sheathing from top of trench to within 2' of bottom.

STRINGERS—

6" x 6" timbers in trenches up to 12' in width.
8" x 8" timbers in trenches 12' to 20' in width.
Run continuously 5' c to c with top stringer not more than 3' from top of trench, braced vertically by not less than 4" x 4" timbers, one on each side of trench at each cross brace.

CROSS BRACES—

6" x 6" timbers for trenches 12' in width placed 10' c to c.
8" x 8" timbers for trenches 12' to 20' in width placed 10' c to c.

OVER 20 FEET IN DEPTH

UPRIGHTS—

2" plank close sheathing from top of trench to within 2' of bottom.

STRINGERS—

6" x 6" timbers spaced 5' c to c for trenches up to 12' in width.
8" x 8" timbers spaced 5' c to c for trenches 12' to 20' in width, each side of trench at each cross brace.
Top stringer to be 3' from top of trench.

CROSS BRACES—

6" x 6" timbers for trenches up to 12' spaced 10' c to c.
8" x 8" timbers for trenches 12' to 20' spaced 10' c to c.

SHAFTS AND TUNNELS

Section 12. The sides of the excavation in all shafts constructed and used for and in connection with the construction of tunnels shall be supported and held in place by a bracing system conforming to the requirements of Section 2 and/or Section 7 and Sections 8 and 9, Chapter IV.

Section 13. The construction and operation of hoisting equipment used in shafts shall conform to the requirements of Sections 1 to 20, Chapter VI, inclusive. Where cages are used, landings shall be provided with gates constructed and operated in accordance with Sections 13 and 14, Chapter VI.

Section 14. Shafts shall be provided with ladders or stairways conforming to the requirements of Section 4, Chapter IV.

Section 15. Standard guard rails and toe boards shall be provided at the tops of shafts or if the shaft opening is partly closed by a deck, such guard rails and toe boards shall be provided at all openings through the deck which are not otherwise guarded.

Section 16. The dimensions of shafts shall be such as to provide for employees passing from one heading to another or crossing from one side of the shaft to another, clear passageways at the bottom of the shaft and/or at other landings outside the areas used or affected by hoisting equipment or facilities. Such passageways at the bottom of shafts shall be provided with substantial overhead protective coverings, except that where the decking at the surface extends entirely over such passageway no other covering need be provided.

Section 17. All pipe, fittings and wires extending down shafts shall be securely fastened and provided with substantial supports.

Section 18. When it is necessary for workmen to work in well holes for hydraulic elevators, screw lifts or similar equipment, the sides of the excavation shall be supported and held in place by a bracing system conforming to the requirements of Sections 9 to 11, Chapter IV, inclusive, depending upon the types of material being excavated.

Section 19. The exposed faces of tunnel excavations shall be supported and held in place by bracing system conforming to the requirements of Section 2 and/or Sections 7, 8 and 9, Chapter IV, which shall be interpreted as requiring, as a minimum, the following:

a. For tunnel excavations, in hard compact material, bracing systems composed of a butting timber sets as shown in Figures 1 to 8 may be used, subject to the limitations shown or hereinafter set forth.

b. For tunnel excavations in other than hard compact material or rock, which would include saturated, filled or unstable soils, bracing systems shown in Figures 9 and 10 may be used, subject to the limitations shown or hereinafter set forth.

OTHER TYPES OF TUNNEL BRACING

Section 20. Bracing systems other than those shown in Figures 1 to 10 and involving the use of metal liner plates or involving modifications or combinations of the systems shown, may be used, subject, however, to the limitations and requirements hereinafter set forth and provided they are of equivalent strength.

a. Where the bracing systems shown in Figures 7 and 8 are used, excavations shall not be carried below the elevation of the foot blocks unless the placing of the full concrete, masonry or other permanent lining follows the tunnel excavation within 25 feet of the face of the tunnel heading and within 48 hours provided, however, that the placing of the lining shall follow immediately

after the removal of the bench below the elevation of the foot blocks. The permissible depth of excavation below the elevation of the foot blocks shall be governed by the angle of repose of the material encountered at the particular place of excavation.

b. Where bracing systems involving the use of metal liner plates with the plates covering less than the entire exposed faces are used, each ring of plates shall be supported on and securely fastened to wood posts or legs so placed that they are parallel to the tangent, to and at the lower end of the ring of plates they support.

c. Where the diameter of the tunnel excavation or the greatest transverse dimension thereof exceeds five feet, horizontal cross braces extending from longitudinal waling pieces on each side at the spring line of the liner plate structure shall be provided. Where the materials being excavated are other than hard compact materials, diagonal cross braces shall be used in addition to the horizontal cross braces. The lower ends of legs, posts and diagonal braces shall bear on bearing plates or foot blocks.

d. Where the diameter or the greatest transverse dimension of the tunnel excavation exceeds 9 feet, the liner plate structure shall be supported by vertical and diagonal braces which are, in turn, supported on a needle beam.

e. On curves or changes in alignment such special plates shall be used as may be necessary to provide a continuous, unbroken line of plates with no offset between rings.

f. Liner plates extending more than 18 inches below the springing line shall be provided with waling pieces and cross braces at the lower end of the plates. In assembling the liner plate structure, adjacent plates shall be bolted together with bolts in each bolt hole and all bolts shall be drawn up tight.

g. The use of metal liner plates with panels "formed in" is prohibited.

h. Tunnel excavation shall not be carried more than 18 inches in advance of the bracing system and the erection of the bracing system shall follow the excavation as close and as soon as practicable.

i. All exposed faces of tunnel excavations, from the commencement of the excavation, shall be supported at all times in such manner that the bracing system at each stage during its erection conforms to the requirements of Section 2 and/or 7 to 11, Chapter IV, in-

clusive, with the exception under certain conditions hereinafter given, of the face of the heading and the face of the bench.

j. After erection, bracing systems shall be kept in place and no part thereof removed, except that where necessary to permit placement of concrete, masonry or other permanent linings, cross or diagonal braces may be removed and where necessary to permit further tunnel excavation, needle beams and their supports may be removed provided, however, that such braces, needle beams and supports shall not be removed unless and until other equivalent means of supporting the loads carried by such members have been provided.

VENTILATION AND TEMPERATURE

Section 21.

a. The employer shall provide a sufficient supply of fresh air in the shafts and tunnel headings at all times so that there will not be more than one (1) part carbon dioxide in one thousand (1000) parts of air by volume. Provision shall be made for the quick and/or continuous removal of gas and/or dust produced from the operations. Employees shall not be permitted or required to enter shafts or tunnel headings after blasting until the gases and smoke resulting therefrom have been removed.

b. In case toxic, explosive or flammable gases are encountered, all work in the shafts and headings shall be discontinued. The Industrial Accident Board shall be notified and work shall not be resumed until an authorized representative of the Board shall have made an inspection of the shaft or heading and authorized the resumption of work. Work may then be resumed only under such conditions as he may impose.

c. The employer shall provide such facilities as may be necessary to maintain temperatures in shafts and tunnel headings, while employees are present, at not more than eighty-five (85) degrees Fahrenheit.

EXCEPTION: In shafts or headings under greater than normal atmospheric pressure every means of maintaining temperatures below eighty-five (85) degrees Fahrenheit shall be tried before work is permitted to continue.

LIGHTING AND ELECTRICAL EQUIPMENT

Section 22.

a. While work is in progress, shafts, tunnels and headings shall be

lighted by means of electricity and shall have a light intensity in foot candles of not less than five (5).

b. In shafts, tunnels and headings under greater than normal atmospheric pressure an auxiliary stand-by source of power for lighting of an intensity of at least two foot candles shall be provided. This temporary lighting circuit shall operate through an automatic switch which shall function within a period of fifteen seconds upon failure of the regular lighting supply and shall be taken from separate primary lines. In lieu of the separate primary lines, a battery supply or other power source that will maintain 91% of the full voltage and the total load of the emergency circuit for a period of four hours shall be installed.

c. The conductors which supply current to all fixtures, receptacles and motors shall be a type approved for use by the National Board of Underwriters for moist and damp locations. The conductors must be supported on approved insulator and protected from mechanical injury throughout.

d. The fixtures to which the lamp socket and plugs are attached shall, in all cases, be vapor, moisture and dust proof. All extension cords shall be made of heavy duty cord. All lamps shall be protected by suitable guards.

FIRE PROTECTION

Section 23.

a. Where water is available fire hose connections with at least fifty (50) feet of fire hose attached shall be provided at shaft openings. Where the shafts and/or headings are under greater than normal atmospheric pressure and the bracing system, exclusive of wedges, foot locks and bearing plates, is composed of flammable material, water lines with hose connections every two hundred (200) feet shall extend into the tunnel headings and at least one hundred fifty (150) feet of fire hose shall be provided for and stored in each heading.

b. A fire extinguisher of adequate capacity and of the proper type shall be provided and installed in all power plants, at all shaft openings and in all tunnel headings.

c. Shaft head frames, if built of combustible materials, shall be open frame work. Head houses shall be built of fire-resisting material.

d. The employer shall place and maintain in shafts and tunnel

headings, printed or commercially lettered signs prohibiting smoking or the use of open flames for any purpose.

EXCEPTION: In the case of open flames for cutting or welding operations, which can only be performed in the shaft or heading, and then only after tests for the presence of explosive gases have been made.

e. Gasoline, naphtha, distillate, fuel oils and other flammable liquids or gases shall be stored in a building kept solely for such storage. The building for such purpose shall be at least three hundred (300) feet from any shaft and shall be at least three hundred sixty (360) feet from any explosive magazine containing two hundred (200) pounds or less of explosives. Gasoline, naphtha or distillates shall not be stored in shafts or tunnel headings. Lubricating oil or grease stored in shafts or tunnel headings shall not exceed one day's supply.

f. Waste lumber, empty boxes, wooden chips, shavings, paper and flammable rubbish shall be promptly removed from shafts and tunnel headings.

g. Flammable materials other than liquids or gases shall not be stored in shafts or tunnel headings nor within twenty (20) feet of any shaft or headings.

h. In shafts or tunnel headings, under greater than normal atmospheric pressure, the employer shall not permit the use therein of any flammable material for the prevention of the leakage of compressed air from the shafts or headings.

TUNNEL WALKWAYS

Section 24. A place of refuge shall be provided by the employer in tunnel headings where the clearance is less than two and one-half (2½) feet between the outermost part of the car or train of cars and the sides of the tunnel headings. This place of refuge shall have at least two and one-half (2½) feet clearance, be not less than six (6) feet in length, be not less than the height of the side of the tunnel or six (6) feet, whichever is the lesser, and at intervals of not more than two hundred (200) feet. A place of refuge shall be provided under the following conditions:

a. Whenever employees and cars transporting excavated or other materials are required to pass one another at other switching points, and/or,

b. Whenever the innermost face of any pipe or wires supported on the sides of the tunnel heading is less than five (5) feet above the level of the runway or walkway.

Section 25. All runways and ramps used in shafts and tunnel headings shall be built and maintained in conformity with the requirements of Sections 1 to 4 inclusive and Section 8, Chapter VIII, provided, however, the width of runway shall be such as to cover the entire width of the tunnel at the elevation of the runway. The platform and all supporting elements thereof shall be designed to support, with a safety factor of not less than four (4), the maximum dead and live loads carried on the runway or ramp.

Section 26.. Where industrial tracks are laid in tunnel headings on other than a runway, a plank walkway not less than ten (10) inches wide for the passage of employees shall be provided between the rails.

Section 27. Forms for concrete, masonry or other permanent lining of tunnels shall be designed, erected and maintained in conformity with the requirements of Sections 6, 7 and 8, Chapter I.

TUNNEL COMMUNICATIONS

Section 28. Where shafts or tunnel headings are under greater than normal atmospheric pressure, an adequate means of audible communication shall be provided between the working chamber or heading and the surface. The communication instrument in the heading shall be of the vapor proof type and shall be located within one hundred (100) feet of the working face and the instrument at the surface shall be located in the powerhouse or other building in which there is an attendant constantly on duty while employees are underground. The communication system shall be provided with a signal mechanism which can be heard or seen for a distance of one hundred (100) feet from the instrument under all normal working conditions.

OTHER DEVICES

Section 29. All power machinery, all power tools and all mechanically powered transportation facilities employed in shafts and tunnel headings shall be operated by electricity, compressed air or hydraulic pressure.

Section 30. An approved warning device or devices shall be provided for mechanically powered transportation facilities when in motion in shafts and tunnel headings.

Section 31. All sumps in shafts and tunnel headings shall be covered with a platform conforming to Sections 6, 7, 8, Chapter I and Section 7, Chapter VIII, or protected with standard guard rails conforming to Section 8, Chapter VIII.

Section 32. The employer shall provide protective hard hats which will afford protection against head injuries from falling objects for all employees working undergorund and it shall be the responsibility of the employee to wear such head protection. Such hats shall be of an approved type.

CHAPTER V

EXPLOSIVES AND BLASTING

Section 1. Sections 69-1901 through 69-1930 of the Revised Codes of Montana, 1947, as amended, and Volume 3, Section 32-21-153, Montana Motor Vehicle Code, are hereby made a part of this Code by reference.

REQUIREMENTS FOR ALL BLASTING OPERATIONS.

Section 2. The employer shall place suitable notices in prominent places in the vicinity of the operations prohibiting smoking during the transportation and handling of explosives and during loading.

Section 3. There shall be one employee, hereinafter called the blaster, in charge of blasting at each location where blasting operations are being carried on and he shall have full authority vested in him by the employer to enforce orders and he shall personally supervise the fixing of all charges and all other blasting operations.

TRANSPORTING EXPLOSIVES

Section 4. The maximum amount of explosives that shall be removed from any magazine and taken to the location of blasting operations or into any shaft, or tunnel, except for storage in an underground magazine shall not be more than is to be used during a period of uninterrupted blasting operations or during an eight-hour period. The shorter of the two periods shall apply. After blasting is completed, all unused explosives and blasting caps shall be returned, at once, to the magazine under the same regulations as when conveying them to the location of the blasting operation.

Section 5.

a. Motor vehicles transporting explosives must be equipped with not less than two fire extinguishers, filled and ready for use, and placed on the vehicle where readily accessible when needed.

b. A motor vehicle must be given the following inspection to determine that it is in proper condition for transporting explosives:

   1. Fire extinguishers are filled and in working order.
   2. All electric wiring completely protected and securely fastened to prevent short-circuiting.
   3. Chassis, engine, pan and bottom of body clean and free of excess oil and grease.

4. Fuel tank and feed line have no leaks.

5. Brakes, lights, horn, windshield wipers and steering apparatus are functioning properly.

6. Tires checked for proper inflation and defects.

c. Motor vehicles transporting explosives must come to a full stop before crossing any railroad track or main highway, and must not proceed until it is known that the way is clear.

d. Blasting caps, when not in the original box of the manufacturer, shall be conveyed in a separate non-sparking metal box, such as aluminum, wood or sponge rubber lined and prominently identified on four sides by the words, BLASTING CAPS.

e. On tunnel work, explosives and blasting caps shall not be taken down the shaft on the same cage or bucket at the same time.

f. If vehicles equipped with radio transmitters are used in transporting electric blasting caps to or from a job, it is recommended that (1) they be carried in a closed metal box, and (2) the transmitter be turned off when the caps are either being put into or taken out of the box. To protect against shock and friction, the metal box should be lined with a soft material such as wood or sponge rubber.

g. Between firing rounds, explosives and blasting caps shall be deposited separately in approved type portable magazines on wooden platforms, no less than twenty-five (25) feet apart and not less than six hundred (600) feet from the location at which the blasting is being done, or in the case of tunnels, from the working face on the side of the heading opposite the electric light and power lines, or in the case of shafts, not less than fifty (50) feet from the outside of the opening.

NOTE: It should be recognized that a hazard of premature or accidental detonation exists by way of radio frequency energy from such sources as radio broadcasting stations, two-way radios, television transmitters, FM stations, radar, Shoran, micro-wave relays and high powered amateur transmitters.

Test results indicate that the following distance tables shall apply:

TABLE I

RECOMMENDED TABLE OF DISTANCES FOR AM TRANSMITTERS

Transmitter Power (Watts)	Minimum Distance (Feet)
5—25	100
25—50	150
50—100	220
100—250	350
250—500	450
500—1,000	650
1,000—2,500	1,000
2,500—5,000	1,500
5,000—10,000	2,200
10,000—25,000	3,500
25,000—50,000	5,000
50,000—100,000	7,000

TABLE II

RECOMMENDED TABLE OF DISTANCES FOR VHF TV, FM BROADCASTING AND FM MOBILE TRANSMITTERS

A. VHF Television and FM Broadcasting

Transmitter Power (Watts)	Minimum Distance (Feet)
1—10	5
10—100	20
100—1,000	60
1,000—10,000	200
10,000—100,000	600
100,000—1,000,000	2,000

B. FM Mobile Transmitters

Transmitter Power (Watts)	Minimum Distance (Feet)
1—10	5
10—30	10
30—60	15
60—250	30
250—600	45

TABLE III

RECOMMENDED TABLE OF DISTANCES FOR UHF TELEVISION TRANSMITTERS

Transmitter Power (Watts)	Minimum Distance (Feet)
1—10	2.5
10—100	8
100—1,000	25
1,000—10,000	80
10,000—100,000	250
100,000—1,000,000	800
1,000,000—5,000,000	2,000

The distances given are based on the worst possible conditions as to wire length, position of the circuit, etc., and also are intended to provide a substantial margin of safety. Under favorable conditions, electric blasting can unquestionably be carried out with no hazard at considerably lesser distances. This should not be attempted, however, until suitable tests have been made to prove that there is actually no danger.

DRILLING

Section 6.

a. All drill holes shall be of sufficient bore to permit the free insertion to the bottom of the hole of a cartridge of explosive without the necessity of undue ramming.

b. Each hole shall be made ready before the dynamite is brought to the hole. No employee shall be allowed to deepen holes that have previously contained explosives.

c. Drilling shall not be resumed after blasts have been fired until a thorough examination has been made for any remaining unexploded charges.

LOADING OF THE HOLES

Section 7.

a. The loading of explosive charges which are not intended to be detonated within a reasonable length of time is prohibited.

b. Holes other than those to be fired at the next round of blasting

shall not be loaded. Hardwood rods only shall be used for tamping and such rods shall not have any metal parts except certain approved connectors for adjoining the sections.

c. All explosives remaining after loading a round shall be removed from the location of blasting operations before any wires are connected.

d. All lights used when loading shall be of an enclosed type. If electric flash lights are used they shall be so constructed that it will not be possible to obtain a difference of potential between any two points on the outside of the light casing.

e. No open flame lights shall be used in the vicinity of open chests or magazines containing explosives or near where a charge is being primed.

f. All crimping of caps on fuse shall be done with crimper and at least twenty-five (25) feet away from explosives.

g. Whenever blasting is being done in a tunnel at points liable to break through to where other workers are at work, the blaster shall, before any holes are loaded, give warning of danger to all workers and he shall not allow any holes to be charged until warning is acknowledged and workers are removed.

PREPARATION FOR FIRING

Section 8.

a. The blaster, when testing circuits through charged holes shall use only approved type of blasting galvanometers. Each electric detonator shall be tested after the primer has been placed in the hole. After the test, the leg wires shall be short circuited by twisting the ends together and shall remain so until ready to be connected to the firing circuit. No tests of circuits in charged holes shall be made until employees are removed to a safe distance.

b. Blasting caps shall be inserted in the explosives only as required for each round of blasting and they shall not be inserted without first making a hole in the cartridge with a sharpened wooden stick. The lead wires of all electric blasting caps shall be electrically shunted before taking them to the location of blasting operations. If the electrical shunt provided by the manufacturer is removed or otherwise rendered ineffective, the lead wires shall be shunted by twisting together. The caps shall be shunted at all

times except when being checked for circuit continuity and when being wired into the blasting circuit.

c. Firing shall be done by (a) safety fuse; (b) approved mechanical or battery-powered blasting machine; (c) a power line electrical source with voltage not to exceed 250 volts. Provided, further, that the wiring and firing system shall conform to the following requirements:

   1. Wiring circuits for blasting shall not be used for any other purpose.

   2. Blasting circuit wires shall not cross over or under other electrically-charged wires unless the blasting circuit wires are fully insulated and are anchored as provided in Section 8 (d), Chapter V.

   3. In permanent installations and where power line electrical source is used, the firing system shall include at least two (2) switches (a safety switch and a firing switch) located at least six (6) feet apart. Connection between the switches should be by a "plug-in" jumper which cannot be plugged into the firing switch without unlocking it and which must be removed in order to lock the switch box. The jumper must be permanently attached to the safety switch (switch nearest the power source), but must not be permanently attached to the firing switch (switch nearest the blasting circuit). Both switches shall be of the double-pole, double-throw type and capable of being locked securely in the "open" position. When locked in the open position, the leads on the blasting circuit side of the switch shall be short circuited (i.e., shunted by the switch mechanism).

d. When firing is done by means of an electric circuit, and the wires leading from the firing-switch to the charge pass under or lie within one hundred (100) feet of overhead power lines, the blasting circuit wires shall be anchored near the charged holes by timbers or other non-conductor materials sufficiently heavy to prevent them from being thrown in contact with the power lines.

e. No blasts shall be fired with fuse and cap in vertical or steep shafts.

f. Within buildings or congested districts, before any blast is fired, the area to be blasted shall be covered on top and sides with timbers bound together with chains or cables, stout metal matting, heavy rope matting, or other material to prevent debris from flying. Timber may be used as weights on rope matting.

g. The blaster shall cause a sufficient warning to be sounded and shall be responsible that all employees retreat to safe shelter before he sets off blast and no employee shall return to the blasting area until the "all clear" signal is given by the blaster.

MISFIRES

Section 9.

a. In firing a round of holes with fuse and blasting caps, blaster shall count the number of exploding shots and if there are any misfires, he shall not permit men to return to the operation until such misfires have been exploded or such holes made safe. At least thirty (30) minutes shall elapse after the charge fails to explode before it is examined.

b. When electric blasting caps are used and any or all of the charges fail to fire, the lead wires shall be disconnected from the electrical power source and shunted by twisting the bare ends together. The shunted leads shall be carried at least half the distance to the charge and left in this location until all inspection and checking have been completed. When such misfires occur, a reasonable time should elapse before returning to the blasting area to make the necessary inspection and corrections.

c. A charge in an open hole that has failed to explode, shall be exploded by inserting a new primer in the hole on the old charge and firing such primer or by drilling, charging and firing another hole at least two (2) feet from the unexploded one.

d. A charge in a tamped hole that has failed to explode shall be exploded by drilling, charging and firing another hole at least two (2) feet from the unexploded.

NOTE: After measures under (c) and (d) have been taken to discharge misfired holes, a careful search should be made for unexploded material in the debris.

e. The charge of explosives from a misfired hole shall not be drilled, bored or picked out.

f. All remaining holes shall be examined by the blaster with a wooden stick for unexploded charges or cartridges and if they are found the same shall be refired before drilling operations are commenced on any shift.

g. All wires in broken rock shall be carefully traced and a search made for unexploded cartridges.

NOTE: If explosives, other than those previously discussed, are used they shall be handled in accordance with the approved safe practices recommended by the manufacturer for that specific explosive but all requirements of this code must be met no matter what type of explosive is used or handled.

MAGAZINES

Section 10.

a. No matches, open lights, or fire of any kind shall at any time be permitted in or around a magazine. If artificial light is needed only an electric flash light or electric lantern of approved types shall be used.

b. No package of explosives shall be opened in a magazine, or within fifty (50) feet thereof, nor shall explosives be stored therein except in closed containers.

c. The area for twenty-five (25) feet in each direction around magazines must be kept clear of dead grass and weeds and other flammable material.

d. Interior of magazines must be kept clean and oldest stocks shall be delivered first.

e. All types of blasting caps in strengths through No. 8 caps should be rated at 1½ pounds of explosives per 1,000 caps. For strengths higher than No. 8 cap, consult the manufacturer.

NOTE: The prevention of accidents in the use of explosives is a result of careful planning and observance of the best known practices. The explosives user must remember that he is dealing with a powerful force and that various devices and methods have been developed to assist him in directing this force. He should realize that this force, if misdirected, may either kill or injure both him and his fellow workers. All explosives are dangerous and must be handled and used with care either by or under the direction of competent, experienced persons. It is the responsibility of all persons who handle explosives to know and to follow all approved safety procedures.

DO'S and DON'TS

It is obviously impossible to include warnings or approved methods for every conceivable situation. A list of instructions and warnings (commonly

known as DO's and DON'TS) has been set forth by the Institute of Makers of Explosives and a copy included in every case of explosives and blasting caps. DO'S and DON'TS, Instructions and Warnings, adopted by the Institute of Makers of Explosives, 250 East 43rd Street, New York 17, N. Y., as revised, shall be incorporated as part of this code by reference.

REQUIREMENTS FOR MIXING, HANDLING, TRANSPORTATION, STORAGE AND USE OF BLASTING AGENTS AND NITRO-CARBO-NITRATES

DEFINITIONS

Section 11.

a. **Ammonium Nitrate.** A chemical compound represented by the formula NH_4NO_3, in any form including prilled, flaked, grained or crushed prills and with or without coatings or additives of clay, diatromaceous earth, or organic or inorganic anti-setting agents.

b. **Blasting Agent.** A commerical blasting agent is an insensitive chemical composition or mixture, containing no nitroglycerin, which can be made to explode when initiated with a high explosive primer or any material or mixture of materials consisting of a fuel and oxidizer intended for blasting, which is not otherwise classed as an explosive, and in which none of the ingredients are classed as an explosive provided that the material or mixture cannot be detonated by a No. 8 blasting cap under the conditions specified in the cap sensitivity test.

c. **Nitro-Carbo-Nitrate.** A blasting agent that has been classified as a Nitro-Carbo-Nitrate under Interstate Commerce Commission regulations and which is packaged and shipped in compliance with these regulations. Nitro-Carbo-Nitrate is ammonium nitrate to which a carbonaceous fuel has been added. Under certain conditions this then can become cap sensitive and classed as an explosive.

d. **Cap Sensitivity Test.** The cap sensitivity test is a simple method of measuring the initiation sensitivity of a blasting agent. A one quart, cylindrical, cardboard carton, of the type commonly used for bulk ice cream, is filled with the blasting agent to be tested and packed to the approximate shipping package density. A commercial No. 8 blasting cap is inserted into the center of the blasting agent through a hole in the top of the carton. The charge is then placed on soft ground in an isolated area with adequate protection for personnel and the blasting cap fired. If a crater is formed in

the soft ground of sufficient size to indicate that any part of the blasting agent detonated, the material is cap-sensitive and must be treated as a high explosive.

STORAGE OF AMMONIUM NITRATE

Section 12.

a. **General Precautions.** Ammonium Nitrate either in bulk or in bags shall be stored so it is easily accessible and safely away from electrical wires, steam pipes, radiators, explosives, organic materials, acids, and any easily oxidized materials including oils, greases, solvents, etc.

b. **Storage Buildings.** Storage buildings for Ammonium Nitrate shall be constructed of non-combustible or fire-resistant materials. Corrugated metal roofing and siding over wood studding is considered satisfactory. The buildings shall be dry, well ventilated, and equipped with spark-arresting screens over the ventilators.

c. **Storage Building Floors.** The storage building floor shall be of non-combustible material, concrete or an approved substitute, and all open drains shall be effectively plugged to prevent molten Ammonium Nitrate flowing into such drains in case of a fire. Any cracks appearing in floor are to be repaired immediately.

d. **Storage of Bags.** Bags of Ammonium Nitrate shall not be stacked closer than thirty (30) inches to building walls or in piles more than twenty (20) feet in width. Aisles between piles of bags shall be not less than thirty (30) inches wide, and shall be placed to provide easy access and ample ventilation. Bags shall not be closer than thirty-six (36) inches from the eaves of the roof or from the supporting or spreader beams.

e. **Storage Building Location.** The following shall be considered in choosing an Ammonium Nitrate storage building location for temporary or permanent storage:

(1) Maximum amount of intended storage.

(2) Congestion of area, including highway and rail traffic, and public buildings.

(3) Availability of fire fighting facilities.

(4) State and Local regulations.

(5) Toxic-fume hazards in event of fire.

f. **Smoking and Open Flames.** Smoking, smoking materials, and open flames are prohibited within twenty-five (25) feet of Ammonium Nitrate storage areas. Signs to this effect shall be posted and the rule shall be enforced.

g. **Loosening of Caked Ammonium Nitrate.** Under NO circumstances shall caked Ammonium Nitrate, either in bags or in bulk, be loosened by blasting with explosives.

h. **General Housekeeping.** The Ammonium Nitrate storage area shall be kept clean and maintained in good housekeeping order. Ammonium Nitrate from broken bags shall be cleaned up promptly and rebagged or removed from the premises.

i. **Storage with Blasting Agents.** If Ammonium Nitrate is stored in the same building with blasting agents, the combined quantity of both materials shall be considered as blasting agent and the location of the storage building must then conform to The American Table of Distances with respect to inhabited buildings, passenger railroads, and public highways.

j. **Storage with Explosives.** Ammonium Nitrate may be stored with explosives only in a properly constructed explosive magazine. The aggregated weight of all stored materials including explosives, blasting agents, and Ammonium Nitrate must then be used to determine conformance with the distance table of The American Table of Distances.

k. **Temporary Bulk Storage.** Bulk storage of Ammonium Nitrate may be in mobile or stationary trucks, vans, tanks, railroad cars, or similar conveyances or containers and shall be subject to the general precautions listed in paragraphs a, b, e, Section 12, Chapter V, and other rules set up herein.

MIXING PLANTS

Section 13.

a. **Location of Mixing Plant.** Plants for mixing Ammonium Nitrate with fuel oil and/or other carbonaceous materials shall be isolated from inhabited buildings, passenger railroads, and public highways in accordance with The American Table of Distances. The quantity of materials used in this determination shall be the maximum amount which will be in the mix building and the immediate area thereof at any one time, except where the raw material is in a separate fireproof building or container, and will include the sum total of the following materials:

1. Finished product.
2. Materials in process.
3. Raw Ammonium Nitrate awaiting processing.

b. **Fuel Storage.** Fuel oil and/or other carbonaceous fuels shall be stored in a separate building or in an outside tank to minimize possible contact between molten Ammonium Nitrate and fuel in case of fire. A shut-off valve shall be installed in the fuel line at the fuel tank.

c. **Separation of Mixing Plant and Storage Buildings.** The location of the permanent storage area for blasting agents with respect to the mixing plant shall be in accordance with magazine separation distances of The American Table of Distances.

d. **Location of Operating Stocks.** The layout of the mixing plant shall be such that there is physical separation between the daily operating stocks of raw Ammonium Nitrate, the finished mixed blasting agents, and the mixing and packaging operations.

e. **Mixing Building.** The mixing building shall be of non-combustible construction; however, buildings made of corrugated metal sheathing over wood studs and framing are acceptable. It should have one or more natural-draft vents, equipped with spark-arresting screens.

f. **Mixing Building Floor.** The floor of the mixing building shall be of concrete or of other approved non-absorbent material. A wash down house and drain shall be provided; however, any pipe-connected drains shall be provided with an effective closure and this closure shall be in place at all times except during wash down.

g. **Building Heat.** Heat for the mixing building shall be provided from a source outside the building. However, space heaters that do not depend on a combustion process within the heating unit may be used if they are properly installed and maintained and are located no closer than thirty (30) inches from raw materials and finished product. Such space heaters must conform to the requirements of the most recent National Electrical Code for installation in an explosive area.

h. **Electrical Equipment.** All electrical switches, motors, controls, lights, etc., located in the mixing building or in the blasting agent storage building shall conform to the requirements of the National Electrical Code for installation in an explosive area; otherwise, they must be located outside the building.

i. **Mixing Equipment.** The design of the mixer shall minimize the possibility of frictional heating, compaction, and especially confinement. Bearings and gears must be protected against accumulation of product dust and shall preferably be of the outboard type. All surfaces must be accessible for easy cleaning. The frame of the mixer and all other permanently located handling equipment shall be electrically bonded together and connected to an effective electrical ground. Mixing and packaging equipment shall be constructed of materials which are compatible with Ammonium Nitrate and with the fuel being used in the blasting agent mix. Zinc and galvanized metals shall not be used because of their tendency to promote and accelerate decomposition of Ammonium Nitrate. Copper shall not be used because of corrosion problems in the presence of Ammonium Nitrate.

j. **Water-Deluge Systems.** An automatic water-deluge system is required to protect the mixing and packaging areas.

k. **Housekeeping.** The mixing and packaging equipment and areas shall be cleaned and maintained properly to prevent accumulation of raw ingredients and finished product. The floors shall be washed down daily and the entire working area cleaned as necessary. Discarded empty Ammonium Nitrate bags must be disposed of daily in a safe manner, such as burning in an isolated location or by burying. The area surrounding the mixing and packaging building shall be kept free of rubbish, dry grass, weeds or other combustible material for not less than twenty-five (25) feet in all directions.

l. **Smoking and Open Flames.** Smoking or open flames shall not be permitted in or near the mixing and packaging building. Signs to this effect shall be posted and the rule shall be rigidly enforced.

m. **Repairs and Alterations.** Welding and cutting with cutting torches shall not be permitted in the mixing or storage buildings while any blasting agent or Ammonium Nitrate is in the building. The building and area shall be cleaned or washed free of all Ammonium Nitrate and blasting agent before any welding or gas cutting operations are started. Where feasible, equipment should be removed from the building for repairs or alterations.

n. **Personnel Limitations.** A limit shall be established by the employer on the number of personnel who may be in the mix building at any one time, and this limitation shall be posted and enforced.

o. **Product Limitations.** No more than one day's production of blasting agent shall be permitted in the mixing and packaging building at any one time.

p. **Labeling.** All cartridges, bags or other containers of blasting agents shall be labeled to indicate their contents and dated. Ammonium Nitrate bags must not be re-used as containers for blasting agents unless they are positively relabeled accordingly.

COMPOSITION

Section 14.

a. **Liquid Fuels.** No liquid fuel shall be used in the blasting agent mix which has a flashpoint lower than that of No. 2 Diesel Fuel (125 degrees Fahrenheit). More volatile fuels such as gasoline, kerosene, or No. 1 Diesel Fuel, are not acceptable because they offer no significant advantage in blasting and do tend to increase the possibility of a vapor explosion and fire. Crude oil and crankcase drainings shall not be used because they may contain low flashpoint constituents or gritty particles which could increase the sensitivity of the blasting agent.

b. **Mix Proportions.** The proportion of Ammonium Nitrate and fuel oil shall be maintained within a reasonable production tolerance. If other carbonaceous fuels are used, an oxygen-balanced proportion shall be maintained. If solid fuels are used they shall be chosen and handled so as to minimize the possibility of dust explosions.

c. **Cap Sensitive Ingredients.** If any cap sensitive ingredients are used or added to the blasting agent mix or package, such as detonating fuse, dynamite, etc., then the entire mix or package shall be considered as Class "A" High Explosive and must be handled as such.

d. **Experimental Mixes.** Unusual compositions or combinations of ingredients shall not be attempted except under the supervision of personnel competent by education and experience to evaluate the possibility of new hazards and unless the operation is equipped to determine the sensitivity of the resultant product. Metal dusts (such as aluminum powder), sulfur, perchlorates, and explosive substances (such as Nitroglycerin, TNT, and other high explosives) shall not be used to sensitize Ammonium Nitrate unless the strict standards of explosive plant operations can be and are met.

Nitrites and chlorates shall not be used in blasting agent formulations.

e. **Cap Sensitivity.** If any change is made in mixing proportions, character of ingredients, or mixing procedure, another cap sensitivity test shall be made immediately.

STORAGE OF BLASTING AGENTS

Section 15.

a. **Storage Buildings.** Standard explosive magazine construction is preferred for buildings used to store blasting agents. However, other buildings which are one-story, without a basement and of non-combustible or fire-resistant construction may be used. The storage building must be kept clean, dry, and free of debris and empty containers. Combustible materials (including flammable liquids), corrosive acids, chlorates, nitrites, or similar materials shall not be stored in the same building with blasting agents.

b. **Van Storage.** Semi-trailer or full trailers used for highway or on-site transportation of blasting agents are satisfactory for temporary storage. Vans must be kept in condition for highway use. Parked vans shall be substantially blocked before they are unhitched from the trailers. Vans containing Ammonium Nitrate must be kept locked when unattended. Lightening protection, separate from the van, shall be provided.

c. **Location of Storage Buildings and Vans.** Buildings for permanent storage and trailers for temporary storage of blasting agents must be located in accordance with The American Table of Distances.

d. **General Housekeeping.** The blasting agent storage building shall be ventilated, kept locked when unattended, and posted with warning signs. The surrounding area shall be kept free of rubbish, dry grass, weeds, and any other materials of a combustible nature for a distance of at least twenty-five (25) feet in all directions. Broken bags or cartridges shall be cleaned up promptly and removed from the area. Blasting agents in bags or cartridges shall be stacked to provide air circulation and easy access by authorized personnel. (This does not apply to van storage.)

e. **Smoking and Open Flames.** Smoking, smoking articles, and open flames are prohibited in or near the blasting agent storage buildings or vans. Signs to this effect shall be posted and the rule shall be enforced.

f. **Prolonged Storage.** Prolonged storage of Ammonium Nitrate-Fuel

Oil blasting agents shall be avoided unless it is demonstrated that the properties of the mix and/or package will effectively prevent segregation and evaporation of the oil.

g. **Combined Storage.** Blasting agents may be stored with explosives only in a properly constructed explosive magazine. The aggregate weight of all stored materials, including explosives, blasting agents, and Ammonium Nitrate must be used to determine conformance with The American Table of Distances.

TRANSPORTATION OF BLASTING AGENTS

Section 16.

a. **General Requirements.** The regulations of the Federal Interstate Commerce Commission and the Montana Motor Vehicle Code, covering the transportation of blasting agents over public highways, shall be considered as minimum requirements.

b. **Vehicles and Drivers.** Vehicles used to transport blasting agents on public highways shall be in a safe operating condition and shall be driven by a competent driver with a driver's license valid for the type of vehicle being driven. Drivers shall be familiar with all applicable Federal, State, and Local regulations and codes.

c. **Mobile Mixing Equipment.** Mobile processing equipment shall not be used for mixing of blasting agents while on public highways or other public thoroughfares or while in populated areas.

d. **Smoking and Open Flames.** No person shall smoke, carry matches or other flame producing devices, or firearms while in or near a motor vehicle transporting blasting agents.

e. **Combined Shipments with Other Materials.** Acids or other corrosive liquids shall not be transported in the same vehicle with blasting agents. If high-explosives are transported in the same vehicle with blasting agents, the combined weight shall be considered as high-explosives and handled as such.

f. **Passenger Vehicles.** Blasting agents shall not be transported in any public vehicle carrying passengers for hire.

g. **Fires and Fire Extinguishers.** All trucks transporting blasting agents shall carry at least one 10 lb. or two 5 lb. or larger Carbon-Dioxide fire extinguishers or at least two 4-lb. or larger dry chemical extinguishers. The extinguishers shall be of an I.C.C. approved type and shall be properly maintained. These extinguishers are effective against ordinary truck fires but are not effective against fires directly involving the blasting agent. Only copious quantities

of water are effective in combating fires in blasting agents. Fires directly involving blasting agents should be fought only in the incipient stage and if efforts to control such a fire appear futile, the area should be evacuated as rapidly as possible.

BLASTING OPERATIONS—GENERAL

Section 17.

a. **Safety Aspects.** Although blasting agents are generally less sensitive to accidental initiation than other explosives, they are still an explosive and should be handled with the care and respect due such a product. It should be remembered that in use they are virtually always combined with a cap sensitive explosive and the entire charge should be accorded the respect due the most sensitive element.

b. **Smoking and Open Flames.** Smoking, smoking materials, and open flames shall not be permitted in the vicinity of any explosive loading or handling operations.

c. **Priming.** Primers of adequate size and properties shall be used to insure against misfires and incomplete detonations. Failure to use adequate priming results not only in poor performance but also can cause copious quantities of toxic gases to be generated when the charge is fired.

d. **Misfires.** When misfires occur with Ammonium Nitrate used as a blasting agent, they shall be treated and handled with the same respect shown to misfires occuring with dynamite. When there is reason to believe a misfire has occurred, no one shall return to the blasting area for a reasonable period of time. All personnel shall make sure it is free of visible reddish-brown fumes which indicate toxic concentrations of nitrogen dioxide gas.

Misfires shall be handled under the personal supervision of a blasting foreman or by competent and qualified personnel.

BLASTING OPERATIONS—ABOVE GROUND

Section 18.

a. **Mixing at the Borehole Collar.** For vertical boreholes, mixing blasting agents by pouring oil onto the raw Ammonium Nitrate (outside the borehole) is acceptable; provided, the proper proportions of fuel oil and Ammonium Nitrate are used and an adequate soaking period is allowed before the mixture is poured into the borehole.

b. **Mixing in the Borehole.** Attempting to mix blasting agents in the borehole by pouring oil onto Ammonium Nitrate previously loaded in the hole is not acceptable. Such a procedure has proven inefficient and is apt to cause misfires and toxic fumes.

c. **Mixing and Delivering Trucks.** Trucks designed to mix blasting agents at the blasting site and/or deliver the mixed material directly into the borehole are acceptable provided:

(1) They meet the requirements for transporting such blasting agents. (See Section 6, Chapter V.)

(2) Produce a mix of the proper proportions and consistency.

(3) Do not subject the mixture to excessive pressures before it is released into the borehole.

d. **Fumes.** Before re-entering the blast area, all personnel shall make certain it is completely free of visible reddish-brown fumes which indicate toxic concentrations of Nitrogen Dioxide gas.

e. (1) **Pneumatic Loading.** The possibility that pneumatic loading devices may generate static electricity in sufficient amounts to cause premature detonation of the priming charge must be recognized. Before pneumatic loading is employed at any operation, thorough tests using adequate equipment shall be made to evaluate this hazard. All loading operations shall be stopped immediately if the presence of static electricity or stray electrical currents are detected, and the condition must be remedied before loading is resumed.

(2) **Pneumatic Loading Equipment.** All elements of pneumatic loading devices shall be electrically bonded together and adequately grounded to dissipate any static charges which might be generated during loading operations. Water lines, air lines, rails or the permanent electrical grounding system for other equipment shall not be used to ground pneumatic loading equipment.

(3) **Pneumatic Loading Hose.** The hose or tube used in the pneumatic loading system to convey the blasting agent from the hopper into the borehole shall be of the semi-conductive type, with a total resistance low enough to dissipate any charge of static electricity which might be generated and high enough to limit any flow of stray current to a safe level. In general, the resistance of such hose should be not less than 5,000 ohms per foot nor more than 3,000,000 ohms for the entire length. Periodic

checks should be made of the hose to assure that the resistance does not change in usage to a value outside the safe operating limits. Metal tubes and wire countered rubber hose shall not be used on pneumatic loading equipment.

f. **Hot Boreholes.** Boreholes heated from drilling or "springing" shall not be loaded until they have cooled to less than 150 degrees Fahrenheit.

SPECIAL RULES

Section 19.

a. If explosives, blasting agents, detonators, blasting caps, or detonating fuses are hauled in or on the same vehicle, the complete load shall be classed as a Class "A" explosive and shall be governed as such.

b. Individual containers used to carry or transport explosives, blasting agents, detonating fuses or blasting caps, separately or with each other, that is being moved over land to the highwall, pit, or magazine, shall be constructed of substantial non-conductive material.

Only the driver shall be allowed to ride on such vehicle, unless a helper is used to handle and transport the above mentioned materials, then the helper shall be permitted to ride along with the driver and never more than two men shall be in the vehicle used for transportation. The driver and helper shall not be permitted to carry any tools, smoking material, other flame making devices, permitted to smoke, nor shall this vehicle be used for any other purpose when carrying explosive materials or mixtures.

c. Blasting agents, explosives, detonators, blasting caps, detonating fuses, etc., stored near or in the pit, highwall, roadway, or general pit area shall be stored in separate closed containers of substantial, non-conductive material, located not less than fifteen (15) feet from power lines, used passageways, roadways, or moving equipment.

When any of the above materials are removed from these storage places for use, they shall be removed in their original containers; and, not more than a 48-hour supply of any of these above mentioned materials (including any surplus remaining from the previous day, shift, or shifts) shall be stored as above.

Primers, detonators, explosives, and detonating fuses when removed from the storage places, shall be kept in their containers until holes are drilled, either on the highwall or in the pit, and

then the materials can be stacked on the ground near the hole ready for use. If power lines or trailing cables of any electrical equipment is within fifteen (15) feet of any such holes, the materials shall not be stored alongside until power lines, cables, etc., are removed.

Charged holes must be properly stemmed to assure maximum efficiency from explosive materials used. The leg wires of electrical detonators shall be kept shunted until ready to connect to the firing cable. A cable of proper voltage capacity and proper length to insure safety shall be used in all blasting operations, and this cable shall also be shunted. Shots shall be fired by the person that connects the detonator to the detonating fuse or its equal, and the shooting cable to the detonator, but before the actual blasting is done, it shall be the responsibility of the man in charge to see that all persons have been removed from the area that will be affected by said blast.

Holes shall not be loaded during an electrical storm nor when there is danger from sparks, flame, or other sources of ignition.

d. All persons shall be forewarned before blasting is permitted and a warning alarm or signal given as set forth in Section 8(g), Chapter V.

e. Guards or suitable signs shall be posted at strategic locations when over-burden is being blasted to prevent anyone entering blasting area. Blasts shall be fired as soon as possible after they are charged.

f. The handling of blasting agents and explosives, the wiring of shots, detonating, and blasting shall be done only by experienced, trained and well-qualified personnel.

g. All magazines, magazine boxes, or other storage facilities, when not attended, must be locked.

h. Plastic or other non-conductive sleeves or liners shall not be used in boreholes being loaded pneumatically unless a positive grounding method is used inside the liner.

i. Because water decreases the sensitivity of blasting agents and increases the output of toxic fumes on detonation, every reasonable precaution shall be taken to protect blasting agents from water both during storage and in use. Before loading boreholes containing water with blasting agents, the water shall be thoroughly removed. If water continues to flow into the hole, a water resistant explosive shall be used rather than a blasting agent.

CHAPTER VI

HOISTING EQUIPMENT

Section 1. No employee shall ride or be permitted to ride upon any material hoist.

Section 2. On bridge or similar work of high elevation or tunnel work where it is necessary to transport or hoist employees in addition to materials during the progress of the work, the guideway of the cage shall be of substantial construction securely enclosing the hoisting cable but permitting free operation. The cage shall conform to the requirements of Sections 42 and 43, Chapter VI, and shall be provided with substantial overhead protection, guard rails, side screens and toe boards. The cables shall be inspected and shall otherwise comply with the requirements of Sections 12 and 13, Chapter I.

Section 3. No employee shall ride or be permitted to ride upon the load, sling, hook, ball or block of any derrick or crane of the bucket of any hoist except that men may be hoisted for the purpose of oiling overhead sheaves and making necessary repairs. This section shall not apply to stacks nor in the erection or dismantling of derricks, hoists and towers.

Section 4. Where an extraordinary emergency exists, or where it is known to be the safest method to reach places difficult and dangerous of access by other means, permission for men to ride hook or material hoist may be granted by the Montana Industrial Accident Board.

Under no circumstances shall the operator move a load while a workman is in the tackle or runner lines.

A "No Riders" sign, to be provided by the Montana Industrial Accident Board, shall be posted on the header of the hoist and on the header of each landing platform.

Section 5. No open hook shall be used with a bucket, cage or skip when operating inside of shafts, towers or smokestacks.

Section 6. No employee shall work in or shall be permitted to work in elevator or hoist shafts when the elevators or hoists are in operation, except when the elevator platform or top is used as a scaffold or when making repairs or while loading or unloading.

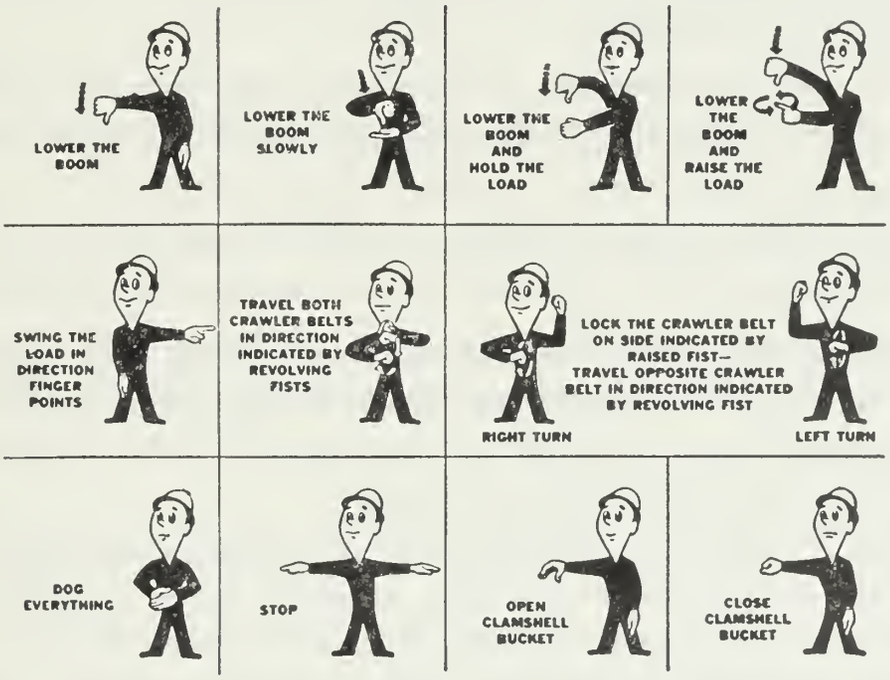
Section 7. No material, tools or other objects shall be hoisted or lowered in elevator or hoist shafts when employees are working therein except such tools, materials and equipment as may be necessary for their work.

Section 8. The operating machinery of all hoisting engines shall be substantially covered to provide protection to the operator thereof when exposed to falling material or objects and to inclement weather.

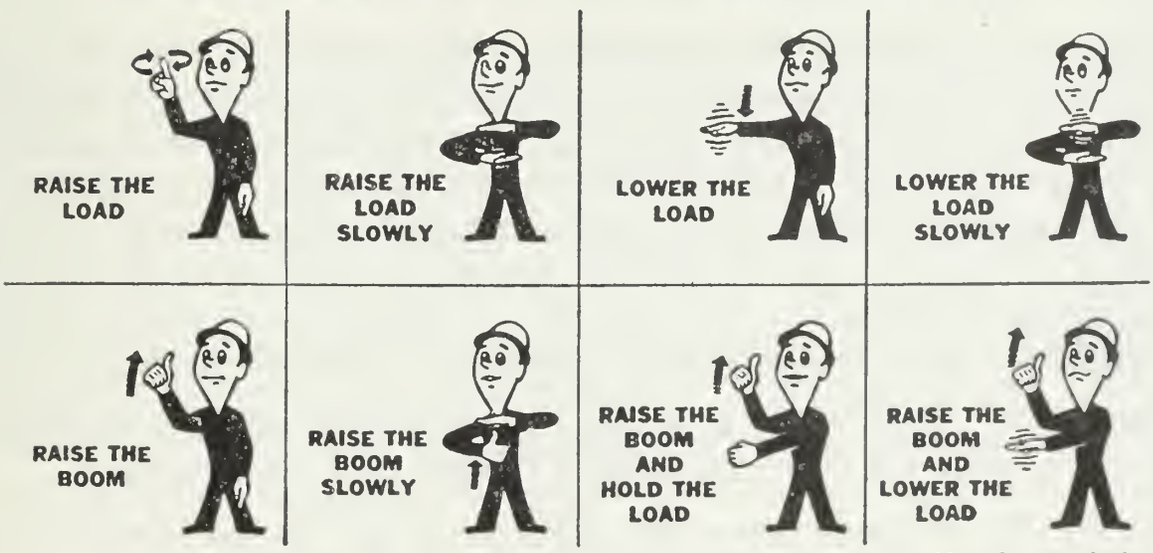
Section 9. All supporting parts of operating machinery shall be set upon a substantial foundation.

Section 10. Hoisting apparatus, such as elevators for brick, concrete and other materials, except where the operator has a clear and unobstructed view, shall be equipped with effective signaling devices. Manual signals are permitted on boom derricks and other apparatus for setting materials such as steel, stone, timber, etc., where close control is necessary. Hand signals, as illustrated in Figure A, shall be used.

FIGURE A.


LOWER THE BOOM
LOWER THE BOOM SLOWLY
LOWER THE BOOM AND HOLD THE LOAD
LOWER THE BOOM AND RAISE THE LOAD
SWING THE LOAD IN DIRECTION FINGER POINTS
TRAVEL BOTH CRAWLER BELTS IN DIRECTION INDICATED BY REVOLVING FISTS
LOCK THE CRAWLER BELT ON SIDE INDICATED BY RAISED FIST— TRAVEL OPPOSITE CRAWLER BELT IN DIRECTION INDICATED BY REVOLVING FIST
RIGHT TURN
LEFT TURN
DOG EVERYTHING
STOP
OPEN CLAMSHELL BUCKET
CLOSE CLAMSHELL BUCKET

HAND SIGNALS FOR SHOVEL-CRANE OPERATION


RAISE THE LOAD
RAISE THE LOAD SLOWLY
LOWER THE LOAD
LOWER THE LOAD SLOWLY
RAISE THE BOOM
RAISE THE BOOM SLOWLY
RAISE THE BOOM AND HOLD THE LOAD
RAISE THE BOOM AND LOWER THE LOAD

Power Crane and Shovel Association

Hand signals for shovel and crane operation.

Section 11. All running lines of hoisting equipment, located six (6) feet or less from the ground or working level shall be guarded, or the operating area restricted, except when loads are moved horizontally.

Section 12. Where practicable, all sheaves, blocks or pulleys in which a wire rope is being used and which is exposed to contact, shall be guarded.

Section 13. All elevator and hoist shafts shall be equipped at each landing, including bottom of shafts, with gates or safety chains.

Section 14. Elevators and host shaft gates or safety chains shall be kept closed at all times except when the elevator or hoist is stationed at the floor level for loading or unloading.

Section 15. Sides accessible to workmen other than gate sides of elevator and hoist shafts at each landing stage including bottom of shaft shall be enclosed.

EXCEPTION. This does not apply to back of ladders on outside of hoist towers, which ladders shall not be used when hoists are in operation.

Section 16. Substantial overhead protective covering of not less than two (2) inch planks or other equivalent material shall be provided in elevator or hoist shafts when employees are working therein. This covering shall not be more than two floor openings above workmen.

Section 17. The landing platforms of all elevators or hoists shall be of sufficient strength to carry the maximum working loads imposed upon them and not less than 75 pounds per square foot, without exceeding the allowable working stresses specified in Tables I to IV, inclusive, Appendix, and shall be equipped with standard guard rails, toe boards and side screens as provided in Sections 8 to 12, Chapter VIII, inclusive.

Section 18. Construction elevators, material hoists, towers, masts, derricks or cranes, not constructed as provided in Sections 33, 45 and 46, Chapter VI, and all other hoisting devices and all the equipment thereof shall be of such material, construction and anchorage as is necessary to carry the maximum working loads imposed upon them, including wind pressure, calculated on a basis of 20 pounds per square foot, in such a manner that the allowable working stresses specified in Sections 6 and 7, Chapter I, will not be exceeded. They shall be erected in a substantial manner and securely held in place.

Section 19. The hoisting equipment operator shall have the final responsibility in deciding the safe load limit of cranes, hoists and derricks.

Section 20. "Safe Hoisting Practices," as published by the Hoist Manufacturers Association, Inc., One Thomas Circle, Washington 5, D. C., are adopted as a part of this Code.

1. DO NOT LOAD BEYOND THE RATED CAPACITY. The immediate danger is the possible failure of some load carrying parts. Overloading might also start a defect which could lead to some future failure—even at less than rated capacity.

2. DO NOT USE ANY OVERHEAD MATERIALS HANDLING EQUIPMENT FOR HANDLING PERSONNEL.

3. CONDUCT A PERIODIC VISUAL INSPECTION FOR SIGNS OF DAMAGE OR WEAR. Particular attention should be paid the cable or chain and hook. If the cable or chain show signs of wear or damage or hook is distorted or opened call it to the attention of the safety engineers before loading the hoist.

4. DO NOT USE HOISTING CABLES OR CHAINS AS A SUBSTITUTE FOR SLINGS—USE SLINGS ONLY. Cable or chain slings should be of proper size and type for load handling—never use slings showing physical damage of any degree.

5. WHENEVER THE HOIST IS LOWERED IN SUCH A MANNER AS TO TAKE THE LOAD OFF THE WIRE ROPE, the operator should determine, before again making a lift, if the wire rope is properly reaved on the drum.

6. STAND CLEAR OF ALL LOADS. If you must travel a load over the heads of other personnel, give ample warning of your intention before you move.

7. ALWAYS "INCH" THE HOIST INTO THE LOAD. Running into the load at full hoist speed imposes excessive overloads on the hoist and could result in failure of parts and/or supporting structure. This is particularly true with high hoisting speeds.

8. LIMIT SWITCHES ARE FOR EMERGENCY USE ONLY and should not be tripped during normal operation. If it is necessary to travel to the limit, use extreme caution and approach the limit in slow speed or by "inching." Do not leave hook block in contact with limit switch at the end of the operation. A phase reversal with the block in this position will probably result in damage to the hoist if the "down" button or control rope is operated.

9. BE SURE THE HOIST RAISES AND LOWERS PROPERLY WHEN THE CORRESPONDING PUSH BUTTONS OR CONTROL ROPES ARE OPERATED. A reversal of direction indicates a phase reversal in the current conductor, the reversal of the rope on the drum or an interchange of wires on a push button—any of which would cause the limit switch to be inoperative. **Do not under any circumstances** operate the equipment until the trouble has been found and corrected.

10. CENTER THE HOIST OVER THE LOAD BEFORE LIFTING. Do not side pull or end pull.
11. KNOW THE HAND SIGNALS for hoisting, cross travel and crane travel if working with cab operated hoists or cranes. Operators should accept the signals of only those persons authorized to give them.
12. DO NOT LEAVE THE LOAD SUSPENDED IN THE AIR UNATTENDED.
13. DO NOT JOG CONTROLS UNNECESSARILY. Hoist motors are generally high torque, high slip types. Each start causes an inrush of current greater than the running current and leads to over-heating and heat failure or burn-out, if continued to excess.

RECOMMENDED REFERENCE: American Standard Safety Code for Building Construction: Safety Requirements for Workmen's Hoists, A10.4-1963, as amended.

OTHER HOISTS

Section 21.

a. No high lift truck, mobile hoist or similar equipment which is self-propelled shall be in motion while the load is being hoisted to a height greater than twelve (12) feet from the base of the equipment. If a height of the lift is greater than twelve (12) feet, the load shall remain at "down" position while the mobile unit is in motion. The mobile unit can only move the width of the platform or hopper when the load has reached its top landing level.

b. A substantial plank or steel matting shall be used where the ground is uneven, loose, soft or filled and shall extend a distance beyond the width and length of the wheel base to provide a substantial foundation.

c. On mobile hoist units, the height of the dumping level shall not be greater than four and one-half (4½) times the width of the wheel base.

d. The platform of a mobile hoist unit used to transport any rolling equipment, such as wheel-barrows, concrete buggies, etc., shall be provided with necessary means to hold the equipment and its load securely.

Section 22. Mast hoists shall be stationary when in use and shall conform to the requirements of this code with respect to guying and anchoring, except where substantial bracing is a component part of the hoist unit. All other requirements covering foundations, hoisting platforms, guarding, emergency brakes and the factor of safety for such equipment shall conform.

Section 23.

a. Gin poles shall be held as perpendicular as possible to clear the load to be lifted. The pole and all component parts shall provide a factor of safety of not less than four (4).

b. Gin poles shall be of selected timber, free of weakening defects, metal fabricated material or steel pipe of equivalent strength.

Section 24.

a. The lifting block of a tripod hoist shall be attached at the apex of the tripod and lifts shall be made only within the radius of the base.

b. If a winding drum is used it shall be equipped with a friction brake and positive pawl.

Section 25.

a. "A" frame lifts shall be as perpendicular as possible to clear the load to be lifted and be supported by substantial guy lines from the top of the frame.

b. If a winding drum is used it shall be equipped with a friction brake and positive pawl.

Section 26. Gin poles, frame derricks and similar hoisting apparatus shall be designed and constructed and have sufficient guy lines to securely support and maintain the maximum working loads to be imposed upon them. Such lines shall be so placed as to prevent excessive swaying and shall be securely fastened to permanent parts of a building, where possible. When fastened to a temporary construction, care shall be taken that such temporary construction and fastening is of substantial strength to hold the load.

EXCEPTION: Mobile mounted apparatus, when substantially supported.

Section 27. The sills of stiff leg derricks shall be substantially secured in such a manner that the derricks will not tip under the maximum working load in any position. Not less than four (4) guy lines shall be used to hold the mast of a guy derrick. Guy lines shall be securely fastened. Where the boom of a stiff leg or guy derrick is longer than the mast, a holding down guy or other device shall be used to prevent pulling off the top fittings. The foot of the mast shall be set on and securely fastened to the sills.

Section 28. Whenever a boom is supported by a tower, the upper fastenings of the falls for raising and lowering the boom shall be placed at a distance not less than one-half (½) the length of the boom above the boom anchor and at a level where guy lines are attached. The supports at these two points shall be designated to carry the extra load caused by the boom.

GENERAL PROVISIONS

Section 29. No person, firm, corporation or contractor, whether private or public (and including governmental agencies and political bodies) or agent of same, shall require, permit or suffer any employee to perform any function in proximity to overhead high voltage lines; to enter upon any land, building, or other premises and there to engage in any excavation, demolition, construction, repair or other operations, or to erect, install, operate or store in or upon such premises any crane, dragline, machinery, equipment, materials or structures, including house moving, well drilling, pile driving or hoisting equipment unless and until danger from accidental contact with said overhead high voltage lines has been effectively guarded against in the manner hereinafter prescribed.

CLEARANCE OR SAFEGUARD REQUIRED

Section 30. The operation, erection or transportation of any tools, machinery or equipment, or any part thereof capable of vertical, lateral, or swinging motion; the handling, transportation, or storage of any supplies, materials or apparatus or the moving of any house or other building, or any part thereof, under, over, by or near overhead high voltage lines, shall be prohibited, if at any time during such operation, transportation or other manipulation it is possible to bring such equipment, tools, materials, building or any part thereof within ten (10) feet of such overhead high voltage lines, except where such high voltage lines have been effectively guarded against danger from accidental contact, by either:

a. The erection of mechanical barriers to prevent physical contact with high voltage conductors;

b. De-energizing the high voltage conductors and grounding where necessary;

c. Installation of an insulated cage-type guard or protective device about the boom or arm of all equipment (except backhoes) and such insulators shall have a dielectric strength sufficient to resist passage of current of not less than **50,000** volts for a period of at least one minute.

   The structural strength of the steel frame shall be such as to sustain a dead load of 1,000 pounds midway between supports without any permanent deflection of members after the load is removed.

   The allowed deflection while loading shall not exceed 1.50 inches.

The Montana Industrial Accident Board approval of any device of above class shall be based on certified copy that same was tested and passed by a nationally recognized engineering testing laboratory, and also field tested on the job for at least one (1) year.

d. Equipping all lifting lines with insulator links on the lift hook connections. Minimum standards for insulator links shall be as follows: The minimum safety requirement on the lift hook connections shall have a dielectric strength sufficient to resist passage of a current of not less than 50,000 volts for a period of not less than three (3) minutes under the tonnage load for which it was designed.

The Montana Industrial Accident Board's approval of such insulator link shall be on the basis that the unit was tested and passed by a nationally recognized testing laboratory and field tested on the job for one (1) year.

Section 31. Only in the case of the above exceptions may the ten (10) foot clearance required be reduced. The required ten (10) foot clearance shall not be provided by movement of the conductors through strains impressed by attachments or otherwise upon the structures supporting the overhead high voltage lines, nor upon any equipment, fixtures or attachments thereon.

WARNING SIGNS

Section 32. The owner, agent or employer responsible for the operation of equipment shall post and maintain in plain view of the operator on each crane, derrick, power shovel, drilling rig, pile driver, or similar apparatus, any part of which is capable of vertical, lateral or swinging motion, an approved weather-resistant warning sign legible at twelve (12) feet, reading, "Warning—Unlawful to operate this equipment within ten (10) feet of high voltage lines." Said warning signs shall be furnished by the Montana Industrial Accident Board.

WOODEN TOWERS

Section 33. Wooden towers shall be constructed of material of a grade not less than that specified in Section 7, Chapter I, of this code, substantially cross-braced and diagonal braced and placed upon firm and substantial foundations.

Section 34. The sizes of the various members in wooden towers shall be not less than the following.

Capacity of Bucket or Live Load of Builders' Cage	CORNER POSTS				HORIZONTAL CROSSTIES		
	Up to 75 ft. High	Up to 125 ft. High	Over 125 ft. High	Guide Posts Thickness	Up to 50 ft. High	Over 50 ft. High	Maximum Spacing of Crossties
500 lb. cage	4"x4"	4"x4"	4"x6"	3"	1"x6"	2"x6"	6'
¼ cu. yd. or 1000 lb. cage	4"x4"	4"x6"	6"x6"	3"	1"x6"	2"x6"	6'
½ cu. yd. or 2000 lb. cage	4"x6"	4"x6"	6"x6"	4"	2"x6"	2"x6"	8'
1 cu. yd. or 4000 lb. cage	4"x6"	6"x6"	6"x8"	4"	2"x6"	2"x8"	8'

NAILING SCHEDULE

	1-Inch Material	2 Inch Material
Diagonal Braces	5-8d	5-16d
Horizontal Ties	5-8d	5-16d

Section 35. Two diagonal braces shall be provided in each panel between horizontal crossties for wooden towers.

Section 36. On wooden tower construction on the outside of buildings or structures not more than two (2) braces shall be removed from any panel between horizontal crossties in the tower at any time and never from two consecutive vertical panels.

Section 37. On wooden towers constructed inside of elevator shafts, hatchways, stairwells, outside courts and light shafts, diagonal bracing of two opposite sides may be removed at the same time, but other bracing or reinforcement of equivalent strength shall be provided.

Section 38. Diagonal cross bracing for all towers shall be placed on each of the four sides and between each tier of horizontal crossties except at landing and unloading platforms, in which case other bracing or reinforcement of equivalent strength shall be provided.

Section 39. Splices of corner posts shall be made with square butt joints, with two battens or scabs at each joint on adjacent sides two (2) inches thick and the width of the post. They shall be extended at least two (2) feet on each side of the joint, or be halved with an even fit and securely bolted.

Section 40. All wooden towers shall be securely guyed or braced against swaying or tipping. When towers are independent of the building they shall be substantially anchored at the top of each corner post and at intermediate intervals of thirty-two (32) feet with not less than three-eighths (⅜) inch steel wire rope or its equivalent strength. The interval of spacing anchors may be increased and the number of guys reduced to permit the use of apparatus

having long booms when the materials used and the method of construction employed provide equivalent strength.

Section 41. The cage or platform sling frame and floor shall be made of materials conforming to and designed in conformity with Sections 6 and/or 7, Chapter I.

Section 42. The side of the cage adjacent to the guide rails shall be closed to the under side of the crosshead.

Section 43. The overhead sheave beams (cathead) shall be designed and substantially constructed to carry the working load and increased stresses of stopping and starting. The sheave beams shall be bolted together, not nailed, and the sheave bearings shall be mounted in all cases on top of the beams and securely bolted.

Section 44. The guide posts and the guide rails shall be of the material and grade as specified in Section 7, Chapter I, and shall be securely fastened and braced. The ends of the guide rails shall be bolted.

STEEL TOWERS

Section 45. All steel construction hoisting towers, masts, etc., shall be substantially constructed; the physical properties of the steel to be such as to carry the maximum working load specified by the manufacturer and shall provide a factor of safety of not less than four (4).

Section 46. All steel construction hoisting towers, masts, etc., shall be placed upon firm and substantial foundations and securely guyed against swaying or tipping. Particular care shall be given to anchoring and guying securely the top of the towers or masts and also at the bucket-dumping position where such equipment is used. Towers, masts or hoists on which booms are to be supported and used shall be so designed or strengthened at the points where the boom may be attached, to sustain safely the maximum working load and the movement of such equipment.

Section 47. Where steel construction hoisting towers, masts, etc., are secured or anchored to a building or structure, they shall be substantially secured at intervals of not more than forty (40) feet. When such towers or masts are erected independent of the building they shall be substantially anchored at the top of each corner post and at intermediate intervals not exceeding forty (40) feet, with not less than three-eighths (⅜) inch wire rope or its equivalent strength. The interval of spacing anchors may be increased and the number of guys reduced to permit the use of apparatus having long booms when the material used and the method of construction employed provide equivalent strength.

Section 48. When it is necessary to remove diagonal bracing at the bottom or other levels of steel towers for loading or unloading or for any other purpose, some other bracing or reinforcement of equivalent strength shall be provided.

Section 49. Where dead men are used as anchorage for derricks, hoists or similar equipment, they shall be of sufficient strength and of such quality as to resist the loads imposed. A dead man hold shall never be less than four feet six inches (4'6") deep in hard compact soil. In other soil the length and depth shall be increased proportionately to provide the equivalent anchorage. The dead man hole shall be solidly backfilled.

CHAPTER VII

CONCRETE CONSTRUCTION

FORMS

Section 1. Form lumber and supports shall be selected after careful consideration of loading factors, including spans, setting temperature, rate of pour and working loads that must be supported.

When scaffolding is used it shall be erected before placing decking on joists to enable men to work safely.

Men constructing forms or placing reinforcing steel where there is a falling hazard shall wear safety belts, or other adequate protection shall be provided.

All loads must be carried to the ground through shoring. Proper allowance must be made for the weight of forms, concrete, men, and equipment.

SHORING

Section 2. Shoring shall be erected, maintained in plumb, and adequate footing shall be provided. All shores shall be spaced to provide a minimum safety factor of four (4). In any 50-foot line of shores, cross-bracing shall be used at least once.

Adjustable shores and tubular steel scaffolding sections shall be erected and loaded in accordance with manufacturer's recommendations. During pouring, one or more workmen shall be assigned to tighten wedges and see that centering supports and other members are in no danger of collapsing, thereby insuring safety of other workmen on job.

REMOVAL OF FORMS AND SHORING

Section 3. Only personnel actually engaged in form stripping shall be allowed in the area during these operations. Hard hats, gloves, and heavy

soled (preferably hard-toe) shoes shall be worn. Approved safety belts and lanyards shall be used if adequate footing is not provided.

Before stripping forms, centering shall be well supported by shoring. Ledgers shall be fastened to shores to prevent the centering from falling.

PRESTRESSED CONCRETE

Section 4.

a. In using anchor fittings for pre-tensioned strands, there shall be complete adherence to the instructions of the suppliers of the fittings, concerning their maintenance and replacement.

b. Extreme caution must be exercised in all operations involving the use of stressing equipment.

c. During the jacking operation of any tensioning element or group of tensioning elements, the anchor must be kept turned up close to the anchor plate whenever possible.

d. Workmen shall not stand in line with the tensioning elements and jacking equipment during the tensioning operation, nor shall they be directly over jacking equipment when deflecting is being done. Adequate signs and barriers to prevent personnel from working behind jacks when stressing operation is in progress shall be provided.

e. Pulling-headers, bolts and hydraulic rams shall be constantly inspected for signs of fatigue, and threads on bolts and nuts shall be frequently inspected for diminishing cross-section.

NOTE: The prestressed concrete in this code applies only to manufacturing on job site.

CHAPTER VIII

SCAFFOLDS, RAMPS, RUNWAYS

Section 1. In the design, construction or erection of all scaffolds, ramps, runways, platforms, horses and all equipment, facilities or devices coming under the provisions of this Code and to comply with Definitions, Section 2, Item L, the maximum working load shall be calculated and the equipment designed and constructed or erected so that when completed it will sustain four times the maximum working or allowable load.

Section 2. All scaffolds, runways, ramps, temporary floors and similar devices and their supporting elements shall be built of materials conforming to and designed and built in conformity with Sections 6, 7 and 8, Chapter I.

Section 3. Unless otherwise specified, planks used for platforms, scaffolds, staging, runways, ramps, etc., shall be laid close together. Such planks may be overlapped or butt jointed. In the former case they shall extend not less than six (6) inches beyond the inside face of the bearings, unless securely fastened. Where planks are butt jointed and nailed to supports, not less than one and one-half (1½) inch bearing shall be used. Where planks project more than one-tenth (1/10) of their length beyond the end bearing they shall be securely fastened to prevent tipping or railed off over end bearings.

RAMPS AND RUNWAYS

Section 4.

a. Ramps and runways shall be not less than two planks wide, each two by ten (2x10) inch.

b. Runways and ramps used for rolling equipment except upon the ground, rough temporary or finished floor, shall be not less than three (3) ten (10) inch planks in width.

c. Where the rise of ramps or runways exceeds one (1) foot in five (5) feet run, nailed cleats at approximately fifteen (15) inch intervals shall be applied to the top surface.

d. Runways and ramps shall be substantially supported and braced to prevent excessive spring or deflection and shall have planks so placed and secured as to prevent loosening or displacement, with battens on the underside to prevent uneven deflection in the planks.

e. A substantial walkway, not less than twelve (12) inches in width, shall be provided for the passage of employees on all bridge and trestle construction work.

WORKING PLATFORMS

Section 5. Unless otherwise specified, platforms for masons and bricklayers shall be not less than four (4) feet in width and not less than four (4) inches from the face of the wall unless space will not permit.

Section 6. Unless otherwise specified, platforms for all other types of scaffolds shall be not less than twenty-two (22) inches in width with battens on the underside to prevent uneven deflection in the planks.

Section 7. The platform and all supporting elements of scaffolds, runways and similar equipment shall be designed to support a minimum uniform load per square foot of platform as follows:

UNIFORM LOAD AND MATERIAL TABLE

Type	Load per Sq. Ft.	Material Allowed
Stone Masons	75 lbs.	Stone on Scaffold
Stone Setters	40 lbs.	No Stone on Scaffold
Bricklayers	50 lbs.	Stocked
Carpenters	25 lbs.	
Painters and Decorators	25 lbs.	
Stucco	30 lbs.	Hod Stocked
Lathers and Plasterers	30 lbs.	

NOTE: If necessary to use scaffolds for other than the above purposes, or for combinations of them, the employer shall determine whether same complies with Section I, Chapter VIII.

NOTE: If concentrated load is used at any point in the span it shall not exceed one-half (½) the uniformly distributed load.

GUARD RAILS, TOE BOARDS, SCREENS

Section 8. Guard rails and toe boards shall be provided as follows unless otherwise specified:

1. On platforms, runways, ramps, scaffolds and similar equipment, which are ten (10) feet or more in height measured from the ground or supporting area, or that are over or adjacent to water, deep holes, excavations, mortar beds, railroad tracks, furnaces, open vats, high tension electric wires, machinery or similar sources of danger.

2. Around the unused sides of all openings in roofs, platforms, floors or shafts, unless covering is provided conforming to the requirements for temporary floors.

3. Where spreaders are used in window or door frames such spreaders shall be substantially secured in place.

4. Wall openings (See Definitions, Section 2, Item Z) shall be protected by standard railings and toe boards or with doors or gates not less than forty-two (42) inches high extending to the bottom of the opening.

Section 9. Guard rails shall be not less than thirty-six (36) inches nor more than forty-two (42) inches in height, measured from floors to the tops of rails, with supporting uprights spaced not more than eight (8) feet on centers, and both substantially constructed of two (2) inch by four (4) inch timber. Other spacing or other material or device may be used provided the strength, pro-

tection and practicability of the construction is equal to or greater than the above specified.

Section 10. Intermediate rails shall be located midway between bottom and top rails and shall not be less than one (1) inch by six (6) inch boards or equivalent material unless otherwise specified.

Section 11. Intermediate rails shall be required in all locations designated in Section 8, Chapter VIII, paragraphs (1) and (2).

Section 12. Toe boards shall be at least four (4) inches in height, constructed of wood, metal or other material and if not flush with the floor, the clearance above the floor shall not exceed one-half (½) inch.

SIDE SCREENS

Section 13. Side screens shall be provided on all scaffolds over twenty (20) feet in height that are adjacent to passageways, or where workmen are employed within ten (10) feet of the base of the scaffold, and where material is piled adjacent to and higher than toe boards. Side screens shall be made of substantial expanded metal or wire netting not larger than two (2) inch mesh or other equivalent material securely fastened in place.

SCAFFOLDS

The plates, figures or sketches shown in the Appendix and to which reference is made in the text shall be construed as types for information or guides only, in the construction of such equipment.

Section 14. Any scaffold found damaged or weakened by altering or from any cause shall be immediately repaired and workmen shall not be allowed to use same until repairs have been completed.

Section 15. When materials are being hoisted up on scaffolds, they shall have a tag line to prevent them striking against the scaffold unless the hoisting equipment is arranged so that there is no danger of material striking the scaffold.

Section 16. All scaffolds four (4) feet high or over with the exception of suspended or swinging scaffolds, shall be provided with ladders or ramps.

POLE SCAFFOLDS

Section 17. Designs and dimensions shown in the Appendix shall be used for all pole scaffolds. Materials of different sectional dimensions may be used, but they shall be of equal or greater strength than that given. Spacing may be increased if the material and the crossbracing to be used are increased sufficiently to give strength and rigidity equal to that required.

Section 18. Pole scaffolds shall be securely and adequately braced and fastened in such manner as to prevent swinging away from the building. Diagonal bracing shall be provided to prevent the poles from moving parallel to the walls or from buckling in any direction.

Section 19. A rolling scaffold constructed of wood shall conform to the requirements of pole scaffolding. Such scaffolding shall be securely guyed or braced against tipping where the height of the scaffold is greater than three (3) times the width.

Section 20.

a. The lower end of the poles or uprights shall rest upon a firm foundation so as to prevent the sinking of the poles and shall be secured against lateral displacement.

b. Spliced poles shall be squared at the butt joints, made continuous and uniformly strong throughout their length with securely nailed or bolted cleats.

c. There shall be not less than two cleats to each splice or joint and the cleats shall be of sound wood not less than thirty (30) inches long, one (1) inch thick and of the width of the poles, equally spaced over the spliced joint.

d. Poles for scaffolds carrying loads less than thirty (30) pounds per square foot may be lap jointed, with lap not less than thirty (30) inches securely fastened. A bearing block shall be placed under the top section and securely fastened to the lower pole.

LEDGERS

Section 21.

a. On scaffolds where ledgers are used, ledgers shall be not less than two (2) inches thick and eight (8) inches wide, unless otherwise specified. If ledgers extend over two (2) consecutive pole spaces they shall overlap the poles not less than four (4) inches. Except where two ledgers meet at right angles, one shall be fastened with its end sawed flush with the pole, the other overlapping in the usual manner.

b. Ledgers shall be level and their top edges at the same height as the bottom opening in the wall for putlogs.

c. Ledgers that carry heavily loaded platforms shall be reinforced by bearing blocks securely fastened to the poles.

d. Ledgers shall be securely nailed or bolted to each pole and when possible shall be nailed or bolted to the inside of the poles or uprights.

PUTLOGS

Section 22.

a. Putlogs shall project not less than six (6) inches over the ledgers. There shall be a putlog at each pole. Where intermediate putlogs are required to carry the imposed load, they shall be spaced at equal intervals.

b. The ends of putlogs on single pole types, shall be built into the wall and shall not be notched nor cut down.

c. Putlogs shall project into the wall not less than four (4) inches and where window or other openings are used, shall be rigidly held in place by substantial supports and bracing.

d. Two successive lengths of planking shall not abut upon a single putlog when laid end to end. When this occurs two parallel putlogs shall be provided not more than eight (8) inches apart so each putlog will support the end of one plank.

e. Where the platform planks overlap on a single putlog the lap of both the lower and upper plank shall be not less than six (6) inches over the center of the putlog. Platform planks shall project over the putlog at the end of the scaffold not less than six (6) inches nor more than twelve (12) inches beyond the face, unless securely fastened against slipping or tipping, or railed off in accordance with Section 3, Chapter VIII.

BEARERS

Section 23.

a. Bearers shall be attached to frame buildings by notching a piece of lumber not less than two by four (2x4) inches by twelve (12) inches long to the thickness and width of the bearer so it will bear evenly on the two (2) inch surface. The plate or piece so prepared shall be nailed securely to the side of the building and the bearer nailed to the plate.

b. Where a scaffold turns a corner, not less than one bearer shall be laid and securely fastened diagonally across the corner, so that one end may rest upon each of the two (2) ledgers that meet at the corner, or by a two (2) by six (6) inch timber nailed to the outside of the end poles to act as bearer. Poles shall be spaced at shorter intervals and platform planks laid as provided in Section 3, Chapter VIII.

c. Platform bearers shall not be spliced. They shall be full length from pole to pole and supported by shoulder blocks not less than twelve (12) inches long.

TUBULAR METAL SCAFFOLDS

Section 24. Approved tubular metal scaffolds may be used in lieu of wood scaffolds provided the specific requirements of this code are complied with for their use, structural strength and uniform load limits. Tubular metal scaffolds shall be substantially constructed of one of the following two (2) types:

a. SECTIONAL OR PANEL METAL SCAFFOLDS means a scaffold substantially built up of prefabricated sections which incorporate the post and horizontal bearer, for carrying the platform planking, substantially braced with diagonal members and locked in place.

b. TUBE AND CLAMP METAL SCAFFOLDS means a scaffold substantially built of individual pieces of metal tubing forming the post, runner, bearer and diagonal bracing, fastened together by approved couplings or locking devices.

Section 25. All tubular metal scaffolds shall be securely and adequately braced and fastened to the building or structure in such a manner as to prevent swinging away from the building. Horizontal ties shall be not more than thirty (30) feet apart and the vertical ties shall be not more than twenty-five (25) feet apart.

Section 26. The platforms of all tubular metal scaffolds shall meet the requirements for material and allowable loads as specified in Section 7, Chapter I and Section 7, Chapter VIII, and the planking requirements of Section 3, Chapter VIII, and Table VI, Appendix.

Section 27. Guard rails, toe boards and screens shall be provided on all tubular metal scaffolds as specified in Sections 8 to 13, Chapter VIII, inclusive.

Section 28. Ladders or steps shall be provided for scaling tubular metal scaffolds. Where sectional frames are designed and erected in such a manner that horizontal members are used as ladder rungs, the spacing of such rungs shall be uniform.

Section 29. All tubular metal scaffolds shall be constructed to have a factor of safety of not less than four (4).

SECTIONAL METAL SCAFFOLDS

Section 30. Sectional metal scaffolds shall be of two (2) types: light-duty

type and heavy-duty type. Each type shall be constructed of the following minimum structural sections and shall not be erected higher than specified and shall not carry loads greater than those provided by this code.

a. LIGHT-DUTY SCAFFOLDS shall have a maximum uniform load carrying capacity of thirty (30) pounds per square foot and shall be limited to a maximum height of forty (40) feet. The load may be concentrated on one level or split between various levels. The maximum space between section frames shall not exceed ten (10) feet.

b. HEAVY-DUTY SCAFFOLDS shall have a minimum uniform load carrying capacity of seventy-five (75) pounds per square foot and shall not exceed the manufacturer's recommended height. The maximum space between frames shall not exceed the spacing specified in Table VI, Appendix, for the operation being performed.

Section 31. The coupling pins for connecting the posts of the frame sections shall be of drop-forge steel or other metal of equal strength. The use of gray iron fittings is prohibited. In addition to the coupling pins, each frame shall have a positive lock or fastener to hold one section to the other vertically where a cantilever or other side pull is exerted on the frame.

Section 32. Cross bracing members for tieing the frames together laterally shall be of uniform length, automatically squaring and aligning the frames so that the erected scaffold is always plumb, square and rigid. Cross bracing shall be continuous for each scaffold.

Section 33. The cross bracing members shall be attached in a secure manner to the post member of the scaffold section and clamped or bolted in the center of the diagonal braces.

Section 34. A base plate shall be attached to the foot of the post of the scaffold frame by a telescoping device or other substantial means. Where the telescoping device screws into the foot of the pipe, the screw shall have square cut threads and be capable of carrying the imposed load. All base plates shall rest on firm foundations and be securely fastened to mud sills when sills are used.

Section 35. On portable rolling metal scaffolds the foot of the poles shall be equipped with wheels or casters especially made for the purpose and provided with a locking device. The span for painters' and decorators' portable rolling metal scaffolds may be ten (10) feet in length provided a reinforced platform or stage is used. Such scaffolds shall be securely guyed or braced against tipping where the height is greater than three times the width of the base.

Section 36. All sectional metal scaffold members shall be painted or coated with weather- and rust-resisting material. Open end members shall be so treated both inside and outside. All units shall be approved by the Industrial Accident Board.

EXCEPTION: Painting non-ferrous materials.

TUBE AND CLAMP METAL SCAFFOLDS

Section 37. The individual members of this type of scaffold shall be of metal tubing except the couplers or clamps which shall be of drop-forge steel or other metal of equivalent strength. Gray iron fittings are prohibited.

Section 38. All vertical and horizontal members shall be fastened together with a coupler or approved locking device, forming a positive connection.

Section 39. Tube and clamp metal scaffolds shall have a runner or "stringer" of metal tubing, locked with fittings end to end and secured to each intersecting post with couplers.

Section 40. Bearers shall be located at each set of posts and at each level, and at each intermediate level where working platforms are installed. Bearers shall be sufficiently long to provide an overhang of at least ten (10) inches beyond the inside and outside posts.

Section 41. Tubular bracing shall be located on the outside of the scaffold and secured to the posts with couplers or in some other approved manner. Tubular bracing shall be applied both lengthwise and crosswise.

Section 42. Crossbracing shall be located at every fourth or fifth set of posts and be attached by couplers to the runners at alternate levels. At foot of posts, where there are no horizontal runners or bearers to attach to, adjustable couplers shall be used for attaching the bracing to the posts.

Section 43. The posts shall be fitted with bases supported on a firm foundation to distribute the load. When wooden sills are used, the bases shall be securely fastened thereto.

SUSPENDED SCAFFOLDS

Section 44. Suspended scaffolds or staging shall be supported from above, the platform of which is supported at more than two points by steel wire ropes suspended from overhead thrustouts or outriggers which are anchored to the building or structure.

Section 45. A suspended scaffold shall be capable of supporting a per square foot working load as specified in Section 7, Chapter VIII, with a factor of safety of four (4).

Section 46. Supporting wire ropes shall conform to the requirements specified in Section 12, Chapter I, and the allowable working loads as shown in Table V, Appendix.

Section 47. The parts of the buildings or structures to which suspended scaffolds are to be attached shall be inspected carefully by the employer or his authorized representative to determine if such parts will support the load to be imposed on the scaffold.

Section 48. The supporting wire ropes shall be secured by wrought iron shackles over the thrustout, with the cable end a spliced eye or thimble, a closed socket, bridge socket or similar effective means. A stop bolt shall be placed through the web of the thrustout to prevent the shackle slipping off the end.

Section 49. All suspended scaffolds shall be provided with a hoisting machine of either the platform or overhead type. All machines shall be of an approved design.

Section 50. Thrustouts shall be equal in strength to a six (6) inch 14.75 lb. I-beam and shall be at least fifteen (15) feet long and shall project not less than one (1) foot beyond the outer edge of the suspended platform.

Section 51. If steel channel beams are used in place of I-beams, they shall be in pairs, placed parallel with flanges turned out and fastened together by bolts not less than three-quarters (¾) inch in diameter over which substantial spreaders shall be placed to keep the channel beams the necessary distance apart.

Section 52. The thrustouts shall be securely anchored to the framework of the building by means of U-bolts and anchor plates, made secure by the use of jam or lock nuts, or where building conditions prevent, by other equally effective means. If sandbags are used, the bags shall be of close woven material and the filled bags shall be securely fastened (lashed) to the inner end of the thrustout.

Section 53. Steel platform bearers shall not be less than a pair of two by two by three-sixteenths (2x2x3/16) inch standard angles or other sections of equivalent strength. If wooden bearers are used they shall be of long leaf yellow pine not less than four by six (4x6) inches in sectional area, or other wood of equivalent strength with the greater dimension vertical.

Section 54. The supporting frames of the hoisting machines shall be bolted to the bearers at the outer and inner ends of the frames with bolts, not less than five-eighths (⅝) of an inch in diameter.

Section 55. Bearers shall be securely fastened to the scaffold fixtures

and spaced according to the load and material table, Section 7, Chapter VIII, but shall not be spaced more than eight (8) feet apart.

Section 56. Platforms of suspended scaffolds shall be not less than thirty (30) inches in width and those used by masons and bricklayers shall be not less than four (4) feet in width when stocked, unless space will not permit.

Section 57. Platform planks shall be laid so that their edges abut and fill the entire width of the platform. Platform planks shall be not less than two by ten (2x10) inches in size and shall overlap the bearer not less than one (1) foot but not more than two feet at the ends of the scaffold.

Section 58. The platform of the scaffold shall be fastened to the building in such a manner and at such intervals as to prevent the scaffold from swinging away from the building. Rollers or fenders may be provided to hold the scaffold the proper distance from the wall.

Section 59. Guard rails and toe boards shall be provided on the outside of all suspended scaffolds as specified in Sections 8 to 12, Chapter VIII, inclusive, and side screens shall be provided on all masons' scaffolds and any other scaffolds covered under Section 13, Chapter VIII.

Section 60. When other operations are being performed above a suspended scaffold, adequate overhead protection shall be provided for those working on the scaffold, as specified in Sections 9 to 11, Chapter X, inclusive.

Section 61. Special scaffolds used for setting stone or other material and commonly referred to as masons' or special swinging scaffolds shall conform to the provisions set forth in Sections 44 to 60, Chapter VIII, inclusive and the following added specific requirements:

a. The scaffold shall not exceed twenty (20) feet in length.

b. Not more than four (4) employees shall be permitted to be on such scaffold at one time and no stone or material shall be placed or stored thereon.

c. Where more than one such scaffold is used upon a structure in close proximity, lashing or tieing of them together is prohibited.

d. Side rails, stringers or horizontal sides shall be of two by six (2x6) inch timber, of spruce, yellow pine or other material of equal strength, as specified in Section 7, Chapter I.

e. Lateral braces or spreaders shall be of material as specified in paragraph d. of this section.

f. Nine lateral spreaders or cross braces of two by four (2x4) inch lumber shall be used. One of these braces shall be laid flat, seven (7) feet from each end and one (1) approximately three (3)

inches from each end, laid on edge and securely nailed through the side rails. The remaining five (5) braces shall rest upon a bearing strip securely fastened to the stringer and shall be securely nailed through the side rails.

g. Each scaffold end shall have a steel channel not less than four (4) inches, 7.25 pounds per foot and thirty (30) inches in length, securely fastened through the side rails by three-eighths (⅜) inch bolts, lock washers and nuts. The channels shall be slotted to receive the scaffold machine hangers.

h. Steel tie rods not less than one-half (½) inch in diameter shall be provided under the two flat spreaders or braces that are spaced seven (7) feet from each end, pass through the side rails and shall be riveted or secured with lock washer and nut. (See Figure 13 A, Appendix.)

i. A guard rail shall be provided on the outside of the scaffold not less than thirty-six (36) inches or more than forty-two (42) inches in height above the platform floor. Steel angle standards for the support of the guard rail shall be provided at each end, of not less than two by two by three-sixteenths (2x2x3/16) inches in size and secured by one-half (½) inch bolts through the side rails. Two intermediate supporting standards approximately three (3) feet in each direction from the center shall be securely fastened to the side rail. The intervening space between the guard rail and the toe board shall be enclosed as provided in Section 13, Chapter VIII.

j. Overhead protection shall be provided as prescribed in Sections 9 to 11, Chapter X, inclusive. In lieu thereof, all wall openings directly above any portion of the scaffold shall be boarded up or covered by a substantial wire screen having not greater than two (2) inch mesh to a height of not less than three (3) feet six (6) inches.

SWINGING SCAFFOLDS

Section 62. A swinging scaffold shall consist of a platform placed on stirrups or hangers that are supported by ropes (Manila or wire) from above and having two point suspension to permit the raising or lowering to suit the required position.

Section 63. Swinging scaffolds shall be not less than twenty (20) inches wide unless space will not permit, nor more than twenty-four (24) inches clear width and shall be attached to stirrups, hangers or supports at intervals not exceeding (20) feet, and shall be supported by rope (Manila or wire) in accordance with Table V, Appendix. If Manila rope is used, in no case shall it be less than three-quarters (¾) inch in diameter.

Section 64. Stirrups, hangers or supports shall be substantially constructed with not less than three-quarter (¾) inch round or one and one-quarter (1¼) inch by three-eighths (⅜) inch steel for the main support frames. The minimum height of all hangers from the bottom to shackle or eye, shall be thirty (30) inches. The guard rail support shall be not less than one-half (½) inch steel rod. Stirrups, hangers or supports shall be securely fastened to the stage or platform by U-bolts or other fasteners that will prevent slipping and shall provide a factor of safety of not less than four (4). The hangers shall be so designed as to support the guard rails, intermediate rails and the toe boards.

Section 65. All cables, ropes, blocks, sheaves and pulleys used in connection with swinging scaffolds shall be securely fastened and shall conform to the requirements for allowable loads specified in Sections 12 and 14, Chapter I. Inspection and tests shall be made in accordance with Sections 11 and 13, Chapter I.

Section 66. All blocks and pulleys shall fit the size of rope they carry and shall be so constructed that they do not chafe or abrade the ropes running through them.

Section 67. Life lines of the strength prescribed in Section 12, Chapter I, shall be provided for each man on all types of swinging scaffold and shall be securely fastened above the operation and extend a sufficient distance below to permit a safe landing.

Section 68. The free ends of falls, etc., shall be guarded to prevent interference with the scaffold equipment by vehicles or other moving objects.

Section 69. Wherever practicable, the platform of swinging scaffolds shall be so lashed or secured while in use that they cannot sway from the structure.

Section 70. When workmen are leaving a swinging scaffold unattended it shall be securely lashed to the building and be cleared of all tools, buckets, or other movable material, or the scaffold shall be lowered to the ground.

Section 71. Two or more swinging scaffolds shall not be combined into one by bridging the distance between them with planks or similar connecting links.

Section 72. The use of swinging scaffolds for setting stone is prohibited except as provided in Sections 61 and 83, Chapter VIII.

Section 73. Where hooks are used to support swinging scaffolds they shall be of a strength equal to steel of a cross section not less than five-eighths

(⅝) by two (2) inches bent edgewise and provide a factor of safety not less than the requirements of this code. Hooks shall rest upon and be securely fastened to substantial parts of the building or structure.

Section 74. Thrustouts or outriggers used to support swinging scaffolds shall be not less than a four by four (4x4), twelve (12) feet in length of straight grain, long leaf yellow pine or its equal and shall not extend beyond the outer wall more than the width of the scaffold and be securely fastened.

Section 75. Before placing an outrigger for a swinging scaffold on any structural part of the building, the employer or his authorized agent shall inspect the structure to determine the soundness of the building for the scaffold system to be supported. If any of the structural parts are found to be defective or not capable of carrying the load, other independent means shall be provided to support the contemplated load.

Section 76. When cleaning down buildings from scaffolds, acid shall be kept from coming into contact with rope. The fall line shall be kept on the outside of the scaffold with the free end coiled in a box or barrel located so the rope will slope away from the building.

Section 77. Ropes that have been in contact with acid shall be immediately removed.

Section 78. Swinging scaffolds shall be equipped with a standard guard rail, intermediate rail and toe board on the exposed side as specified in Sections 8 to 12, Chapter VIII, inclusive.

Section 79. Three-fourths (¾) inch Manila rope or wire rope of equal strength securely fastened, may be used for intermediate rails on swinging scaffolds.

Section 80. The swinging scaffold platform shall be one of the three following types:

a. The ladder platform type, consisting of boards upon a horizontal ladder, the sides of which are parallel;

b. The plank type, consisting of planks supported on the stirrups or hangers;

c. The beam type, consisting of longitudinal side stringers with cross beams or spreaders set on edge and spaced not more than four (4) feet apart, on which the longitudinal platform planks are laid.

LADDER PLATFORM TYPE

Section 81. Ladder platform swinging scaffolds shall be constructed in accordance with the requirements in the table following. Not more than two (2) men shall be permitted on this type at one time.

Length of Ladder	Min. Inside Width	Rail Cross Section Ends	Rail Cross Section Middle	RUNGS No.	RUNGS Diameter	IRON RODS No.	IRON RODS Diameter	Flooring
16′	20″	1¾″x2¾″	1¾″x3¾″	11	1⅛″	4	¼″	½″x3″
18′	20″	1¾″x3″	1¾″x4″	12	1⅛″	4	¼″	½″x3″
20′	20″	1¾″x3″	1¾″x4½″	13	1⅛″	4	¼″	½″x3″
24′	20″	1¾″x3″	1¾″x4¾″	16	1⅛″	5	¼″	½″x3″

Notes:

1. All sizes and dimensions are minimum.
2. Rail sides shall be of ladder stock as specified in Section 3, Chapter IX.
3. Rungs shall conform to the requirements of Sections 4 to 6, Chapter IX, inclusive.
4. Steel rods pass through the sides and be riveted over washers at both ends.
5. Floors shall be of western hemlock or equivalent material with upper surface dressed. The strips shall be spaced not more than five-eighths (⅝) inch apart, except at rails where the space may be one (1) inch.
6. The ladder platform shall be attached to stirrups, hangers or supports of the grade and strength as specified in Sections 63 and 64, Chapter VIII and located not more than two (2′) feet and not less than one (1′) foot from the ends of the platform.

PLANK TYPE

Section 82. Swinging scaffolds may be constructed of planks supported by stirrups or hangers spaced not to exceed sixteen (16) feet and of the size, grade and attachment as specified in Sections 62 and 63, Chapter VIII. Where two or more planks are used they shall be tied together with cleats, not less than one by six (1x6) inches in size, spaced at intervals of approximately four (4) feet and securely fastened to the underside of the planks. The platform planks shall extend not less than six (6) inches nor more than twelve (12) inches beyond the supporting stirrups or hangers. The span between hangers and the size of planks shall conform to the provisions for allowable loads and stresses given in Table I, Section 7, Chapter I and the requirements of Section 7, Chapter VIII.

BEAM TYPE

Section 83.

a. Swinging scaffolds may be constructed by use of two or more longitudinal beams not less in size than two by six (2x6) inches, with cross braces not less than two by six (2x6) inches in size set on edge, securely fastened through the longitudinal beams at intervals of not more than four (4) feet and covered with wood flooring securely nailed to the beams. The longitudinal beams shall extend not less than six (6) inches nor more than twelve (12) inches beyond the supporting stirrups or hangers. The size, grade and attachment of stirrups or hangers shall be as provided in Sections 64 and 65, Chapter VIII and the construction of such scaffolds shall conform to Figure 13b, Appendix, the allowable loads and stresses specified in Sections 7 and 22, Chapter I and the requirements of Section 7, Chapter VIII. This type of swinging scaffold may be used for setting stone up to and including four (4) stories in height. Not more than two (2) men shall be permitted on this type of scaffold at one time and no stone or other material shall be placed or stored thereon.

b. Overhead protection shall be provided as prescribed in Sections 9 and 10, Chapter X. In lieu thereof, all openings directly above any portion of the scaffold shall be boarded up or covered with wire screen, not greater than two (2) inch mesh, as specified in Section 61 j., Chapter VIII, to a height of not less than three (3) feet six (6) inches. Such scaffolds shall not be tied together but the platforms thereof shall be so lashed or secured that they cannot sway from the structure.

OUTRIGGER SCAFFOLDS

Section 84. Outrigger or thrustout members shall be constructed in compliance with the provisions for allowable loads and stresses in Section 7, Chapter I, and Section 7, Chapter VIII; shall conform to the general requirements for masons' pole scaffolds and shall not project more than six (6) feet from the outer face of the structure. The strength of the outriggers or thrustouts shall be not less than the strength of a western hemlock two by ten (2x10) inch timber, on edge. (See Figure 14, Appendix.)

Section 85. Outriggers shall be securely supported and fastened in place at their inner ends.

Section 86. Thrustouts shall not be built into a wall and left with no other support, but shall project entirely through the wall or through windows and be substantially supported and braced.

Section 87. Where pyramiding or built-up scaffolding is done on an outrigger or where it is necessary to extend the outrigger more than six (6) feet beyond the face of the structure, the beams shall be of metal or extra heavy timber and shall be substantially supported and securely fastened. In such cases the scaffold proper shall conform to the requirements for pole scaffolds.

Section 88. Inspection of structural parts upon which the outrigger is to be placed and the provision for independent means of support as specified in Section 75, Chapter VIII shall apply to outrigger scaffolds.

Section 89. Working platforms suspended from outriggers shall have suspension frames, the vertical members of which shall be not less in size than two (2) inch by six (6) inch timber, extending not less than ten (10) inches above the tops of outriggers and fastened to the outriggers by shoulder blocks resting on the outriggers and fastened to the vertical members. Such blocks shall be not less in size than two (2) by six (6) inch by eight (8) inch timber. The bottom ends of vertical members shall extend not less than ten (10) inches below the bottom of bearers and shall be fitted with shoulder blocks the same as provided above, upon which the bearers shall be set. The bearers shall be not less in size than two (2) inch by six (6) inch timber. The suspended frames shall be securely and substantially braced to prevent excessive sway. Other types of suspended outrigger scaffolds may be used, provided they comply with Section 1, Chapter VIII.

Section 90. The platform shall consist of not less than three (3), two by ten (2x10) inch planks laid as provided in Section 3, Chapter VIII.

Section 91. Outrigger scaffolds shall never be used for the storage of materials other than materials for immediate use.

Section 92. Guard rails, toe boards, side screens and overhead protection shall be provided as specified in Sections 8 to 12, Chapter VIII, inclusive, and Sections 9 and 10, Chapter X.

MASONS' SQUARE FRAME OR HORSE SCAFFOLDS

Section 93. All horse and frame scaffolds shall be constructed in conformity with the allowable loads and stresses prescribed in Section 7, Chapter I and Section 7, Chapter VIII and maintained in good condition. The practice of nailing extension legs on horses to increase their height and of nailing extensions on bearers to increase their width is prohibited. The height of horse or frame scaffold platforms when erected in tiers shall not exceed fourteen (14) feet.

Section 94.

a. Masons' horse or frame scaffolds and platforms shall be not less

than four (4) feet wide and not more than four (4) feet six (6) inches high. Platform boards shall be not less than two (2) inches in thickness by ten (10) inches wide and shall overlap the frames or horses not less than four (4) inches.

b. When the weight of the masons' material to be handled exceeds thirty (30) pounds per unit of such material, the height of the lift shall be limited to three feet six inches (3'6").

Section 95. All horse or frame scaffolds shall be set level on substantial foundations. When built more than one (1) tier high, the horses shall be set in vertical lines, separated at each tier with a continuous two (2) inch plank placed under the vertical members thereof with cleats nailed to planks to prevent the end horse slipping off support and with all parts of the scaffold securely braced to give rigidity to and to prevent excessive swaying of such scaffolds.

Section 96. The placing of more than one brick, tile or similar object under the leg or frame to raise or level the horse or frame to the desired level is prohibited.

Section 97.

a. The center to center distance between horses or frames shall be not greater than eight (8) feet. Distance between legs of horses at bottom shall be not less than two-fifths (2/5) nor more than three-fifths (3/5) the height of the horse.

b. Frames used to support masons' scaffolds shall be constructed in accordance with the following sectional dimensions and shall be securely fastened on both sides at the corners and shall have diagonal braces on both sides running from the center on each side to the center of adjacent sides. The frames shall be diagonally braced in front and have a lateral brace through the back centers of the frame of not less than one by six (1x6) inch material. (Figure 16, Appendix.)

MEMBERS	DIMENSIONS
Bearers	2"x6"
Legs	2"x4"
Corner braces of frames	1"x4"
Diagonal braces of frame	1"x8"
All frame supporting braces	1"x6"

c. Hinged frames used as horses to support masons' scaffolds shall be constructed similar to squares or frames with diagonal bracing. They shall be provided with substantial cables and chains or other suitable measures to prevent spreading at the bottom, a

distance not less than two-fifths (2/5) nor more than three-fifths (3/5) the height of the horse. (Figure 15, Appendix.)

The following are the minimum sectional dimensions:

MEMBERS	DIMENSIONS
Bearers two (2)	1"x8 or 1"x6" full thickness
Legs	1"x8 or 1"x6" full thickness
Braces—Diagonal at bottom	1"x4"

d. Horses and frames used exclusively for the stone masons' scaffolds shall be constructed as follows:

MEMBERS	DIMENSIONS
Bearers	4"x4"
Legs	2"x4"
Braces	1"x6"
Half diagonal braces	1"x4"

Section 98. Not more than one (1) tier of horse or frame scaffold shall be placed upon another type of scaffold. When the working platform of such imposed scaffold is ten (10) feet or more in height such imposed scaffold shall be securely fastened, substantially braced and provided with standard guard rails.

Section 99. On patented horse or trestle bracket-type scaffolds, where no provision is made for the displacement of the legs, the same diagonal and lateral bracing shall be used as required for hinged type horses. The height of bracket type scaffold shall not exceed that specified for the other masons' scaffolds.

FOOT SCAFFOLDS

Section 100. Foot scaffolds shall not exceed eighteen (18) inches in height, measured from the level upon which the supports are placed.

Section 101. Mason's foot scaffolds imposed on other scaffolds and supported on brick or tile shall be limited to twelve (12) inches in height and have a bearing surface of at least ninety-six (96) square inches. When in excess of twelve (12) inches and up to eighteen (18) inches, the supports shall be small horses not more than one tier high.

Section 102. The construction of such scaffolds shall conform to the allowable loads and stresses as given in Section 7, Chapter I and Section 7, Chapter VIII.

IRON WORKERS' (NEEDLE BEAM) SCAFFOLDS

Section 103. For riveting, drilling or other work on structural steel where flooring has not been completed, the scaffold shall be constructed to carry the imposed load with a safety factor of four (4).

Section 104. Needle beams shall be securely and substantially held in place, and platform planks shall be secured to such beams by substantial cleats, drop belts, lashings or other safety devices to prevent them from slipping, tipping or shifting. Where the planks to be used are in a steeply inclined position they shall be provided with cleats to insure a safe foothold.

Section 105. Where one end of the needle beam is supported on the structure it shall have a bearing surface equal to its width. If the end does not project at least six (6) inches beyond the supporting member it shall be lashed or otherwise secured against possible shifting.

Section 106. Needle beams not more than ten (10) feet in length shall be not less than four by six (4x6) inches in cross section, of sound wood or other material of equal or greater strength. They shall be two feet longer than the distance between supports; shall be one solid piece without splicing, and provided with means to prevent supports from slipping over the ends. When conditions require longer beams, the cross section shall be increased in accordance with the length of the beams and the weight to be supported, or a center support or hanger for needle beams provided every eight (8) feet. Suspending members shall meet the requirements of Section 11 and/or Section 12, Chapter I and shall be securely fastened to the beams or girders to prevent slipping.

Section 107. Platforms shall be not less than twenty-eight (28) inches in width, unless space will not permit. Material used for platforms shall meet the requirements for allowable loads and stresses as provided in Section 7, Chapter I and Section 7, Chapter VIII.

Section 108. Unless space will not permit, rivet-heaters' platforms shall be constructed of two (2) inch planks laid close together, not less than ten (10) feet long by six (6) feet wide and provided with standard toe boards.

FLOAT OR SHIP SCAFFOLDS

Section 109. Float or ship scaffolds shall be used only for the support of men doing riveting or other light work. Not more than two (2) men shall work on this type of scaffold and it shall not be used for the storage of material.

Section 110. Lumber used in construction shall conform to the requirements of Section 7, Chapter I.

Section 111. Bearers and planks for platforms shall never consist of spliced material.

Section 112. Platforms shall be not more than five (5) feet wide and eight (8) feet long.

Section 113. The supports shall be not less than one and one-eighth by six (1⅛x6) inch, rough sawed, selected spruce lumber and shall project not less than six (6) inches beyond the platform on both sides. An additional diagonal support of not less than one and one-eighth by six (1⅛x6) inch lumber shall extend from bearer to bearer underneath the platform and each platform board shall be securely fastened to the two parallel bearers. If plywood is used as the platform, not less than two by four (2x4) framing shall be used as the supporting members.

Section 114. The platform shall be of not less than full one and one-eighth by six (1⅛x6) inch selected spruce, rough sawed and of uniform thickness or material of equivalent strength, or if plywood is used as the platform, it shall be fir of not less than three-quarters (¾) inch thickness.

Section 115. Ends of platform planks shall extend at least six (6) inches beyond the outer edges of the bearers.

Section 116. Supporting ropes shall be of a size and strength that will support the suspended load with a factor of safety of not less than four (4). If Manila rope is used, it shall be not less than seven-eighths (⅞) inch in diameter.

Section 117. Each bearing member of the platform shall be supported by a continuous rope securely fastened to a substantial overhead support.

Section 118. Railings and toe boards as specified elsewhere in this code shall not be required on float scaffolds.

CARPENTERS' BRACKET SCAFFOLDS

Section 119. Carpenters' portable bracket scaffolds shall be constructed and erected in conformity with the unit stresses and allowable loads as given in Section 7, Chapter I and Section 7, Chapter VIII. Bracket scaffolds when constructed of metal shall not be used at height exceeding sixteen (16) feet; when constructed of wood they shall not be used at a height exceeding fourteen (14) feet.

Section 120. The minimum width of platforms on carpenters' bracket scaffolds shall be not less than fifteen (15) inches, laid in compliance with Section 3, Chapter VIII. The planks used in the platform shall have battons on the underside between the bearers.

Section 121. Brackets shall be securely anchored to the studding and not to the sheathing and they shall be securely braced against spreading or turning. Maximum spacing of brackets shall not exceed eight (8) feet center to center. Not less than four (4) sixteen (16) penny nails or a bolt not less than one-half (½) inch in diameter, shall be used to hang each metal carpenter's bracket. When composition sheathing is used, provision shall be made to prevent the lower bracket end from breaking through the sheathing.

CARPENTERS' AND OTHER LEAN-TO SCAFFOLDS

Section 122. Carpenters' and other lean-to scaffolds shall have the bearer or putlog secured to the building wall at the bearer level by means of a bearing block or by recessing into the wall and shall be supported with a knee brace. The legs or uprights of the scaffold shall be supported at the bottom of a spreader brace; if wood is used it shall not be less than one by six (1x6) inch material. The span of lean-to scaffolds shall not exceed eight (8) feet, bearer to bearer. Lean-to scaffolds shall not exceed eight (8) feet in height and they shall not be pyramided.

PAINTERS' AND DECORATORS' SCAFFOLDS

Section 123. The platform and parts of a ladder scaffold shall conform with the following:

a. Scaffold Plank—The span of a scaffold plank shall not exceed eight (8) feet between the bearing members unless provided with a center support.

b. Ladder Scaffold Plank—(pick)—Side rails to be equal to strictly ladder grade material. The following side rail dimensions shall be followed:

LENGTH	RAIL SIZE
10'x14'	1-⅜"x2-¾" or 1-5/16"x3"
16' to 18'	1-⅜"x3" or 1-5/16"x3-¼"
20'	1-⅜"x3-½" or 1-5/16"x3-¾"
22' to 24'	1-⅜"x3-¾" or 1-5/16"x3-¾"

1. Wood rungs and their mountings shall conform to the requirements of Sections 4 and 6, Chapter IX, and the rungs shall be spaced not to exceed sixteen (16) inches center to center.

2. Metal tie rods not less than three-sixteenths (3/16) inch in diameter and equally spaced but not more than ten (10) feet centers shall be securely fastened to the side rails to prevent spreading. There shall be not less than three (3) tie rods to a plank.

3. The decking shall be straight grained, clear western hemlock or equal strength and not less than one-half (½) inch in thickness when the rung spacing does not exceed twelve (12) inches center to center. When the spacing is greater than twelve (12) inches center to center the decking shall be increased in thickness to provide sufficient strength to carry the imposed load as specified under Part 4 of this section.
4. A ladder scaffold plank shall not exceed sixteen (16) feet in length unless a truss of five-sixteenths (5/16) inch wire rope or one-quarter (¼) inch steel rod or its equivalent supporting member is used the full length of the side rail. Pick plank shall not project less than one (1) foot or more than two (2) feet beyond the bearing member at each end. The imposed load shall not exceed four hundred eighty (480) pounds for a sixteen (16) foot span, or comparable imposed loads at shorter or longer spans.
5. Ladder scaffold plank shall be not less than twelve (12) inches wide.

c. Kick Plank—A kick plank shall be either a scaffold plank or a pick plank. Trussed planks shall not be used as a kick plank.

d. Stringer—The stringer shall be composed of either scaffold or pick plank and shall conform with all the requirements relating to the span and load of the type of plank used.

LADDER JACK

Section 124.

a. A ladder jack shall be attached to and detachable from both the rungs and the rails of a ladder with the bearing members attached to the side rail with an adjustable bearer for the support of a platform. All members shall provide a factor of safety of at least two (2).

b. Ladder jack scaffolds shall be composed of two ladders, two ladder jacks and a working platform not less than ten (10) inches in width. The working platform may be either scaffold plank or a pick plank. Ladder jacks shall not be used at a greater height than thirty-two (32) feet above the ground or supporting level. If extension ladders are used, a substantial center support for the ladders shall be provided.

c. Plank bearers of ladder jacks shall be so adjusted to prevent plank from slipping from the bearers.

d. No scaffold jack shall be supported by the top rung of a ladder.

e. No pull-apart extension plank shall be used as a platform in the erection of a ladder jack scaffold.

f. Lap plank shall be supported at each lap by a jack attached to the ladder.

g. The number of men working on each ladder jack scaffold shall not exceed two at any one time.

STEP LADDER AND "A" LADDER SCAFFOLDS

Section 125.

a. A step ladder scaffold, an "A" ladder scaffold or an extension "A" ladder scaffold shall be composed of two (2) or more step ladders, "A" ladders or extension "A" ladders, placed on line to support stringers upon which are placed kick plank platforms, not exceeding one platform to a bay.

b. The number of men working on each bay shall not exceed two (2) at any one time.

c. A kick plank may be composed of one (1) and shall not exceed two (2) scaffolding planks or ladder scaffold plank laid side by side upon a stringer.

d. In step ladder scaffolds, the platform elevation shall not exceed eight (8) feet above the supporting level, and in "A" ladder scaffolds shall not exceed sixteen (16) feet; in extension "A" ladder scaffolds shall not exceed twenty-eight (28) feet.

e. When a platform elevation exceeds ten (10) feet above the supporting level it shall consist of two (2) scaffold planks or two (2) ladder scaffold planks laid side by side.

f. When an extension member is used for the support of a platform or stringer the elevation of the bearer or the bearing rung shall not extend above the apex of the "A" ladder a height greater than specified in Section 18 e. 9, Chapter IX.

g. All scaffolding, assemblies and erections defined in this ladder scaffold section shall be constructed as one-tier scaffolds; no other tiers or units shall be imposed upon their platforms.

h. Guard rails, intermediate rails and toe boards shall not be required on any ladder scaffolds.

TRESTLE SCAFFOLD

Section 126.

a. A trestle scaffold shall be composed of two (2) or more trestles or extension trestles placed in the same manner as provided for ladder scaffolds.

b. The platform elevation for trestle or extension scaffolds shall not exceed sixteen (16) feet above the supporting level.

c. All provisions of Section 125 b., c., e., and f., Chapter VIII, shall apply when trestles are used as the supporting member of a scaffold.

d. Trestles shall be made of sound, straight-grained material and braced so as to be rigid and to resist pressure from side thrusts.

e. The nailing of extension pieces on the legs of trestles to increase the height is prohibited.

WINDOW JACK SCAFFOLDS

Section 127.

a. All window jack scaffolds shall be of an approved type and shall be securely anchored to and supported by the sides of sill.

b. Window jack scaffolds shall be used only for the purpose of working at the window through which the jack is placed.

c. The placing of planks between one window jack and a jack in an adjacent window is prohibited.

d. Window jacks shall not be used as supporting elements for other scaffolds.

e. Not more than one person shall be permitted to be on a window jack scaffold at any one time.

f. The platform of window jack scaffolds shall be not less than twelve (12) inches wide.

CHIMNEY, STACK AND TANK BRACKET SCAFFOLDS

Section 128. A chimney, stack or tank bracket scaffold shall be composed of a platform supported by wood or steel brackets, hooked over a steel rope which surrounds the circumference of the chimney, stack or tank. The minimum width of platform shall be fifteen (15) inches. This scaffold and parts thereof shall be designed with a safety factor of not less than four (4).

Section 129. A bracket suspension hook shall be steel, one-fourth inch

by two inches (¼x2) and not less than twelve (12) inches in length, with a hook of not less than three (3) inches, securely bolted through the bracket leg.

Section 130. Spacer blocks shall be provided to hold the suspending cable away from the structure and they shall be not less in size than two (2) inches by four (4) inches by twelve (12) inches.

Section 131. All suspending cables shall be improved plow steel 6x37 wire rope or equivalent, and shall conform to the allowable loads as set forth in Section 12, Chapter I. In no case, shall wire rope be less than one-half (½) inch in diameter.

Section 132. The turnbuckles on suspending cables shall be not less than one (1) inch drop forged steel. The cables shall be provided with cable safety clips and thimbles as covered in Section 21, Chapter I.

Section 133. All chimney, stack and tank bracket scaffolds shall be equipped with guard rails, intermediate rails and toe boards securely fastened.

Section 134. For access to and descending from a chimney, stack or tank bracket scaffold, a scaling ladder or boatswain's chair shall be provided.

Section 135. In the construction or demolition of steel chimneys, stacks or tanks or similar structures, substantial lugs shall be securely bolted and/or fully welded to the steel structures to receive the bracket hook.

Section 136. Platforms supported on the rim of masonry chimneys or stacks are prohibited.

Section 137. In construction of chimneys or stacks where an inside scaffold is being used, the working platform shall never be less than eighteen (18) inches below the top of the wall.

ROOFING DEVICES

Section 138.

a. Devices used in the construction of pitched roofs or construction on pitched roofs, shall be securely fastened in place.

b. Safety devices shall be used on all roof construction having a pitch of four (4) on twelve (12) or more.

c. Shingling footlocks shall be not less in size than two by four (2x4) inch timber secured in place by properly spaced tin strips, not less than four (4) inches wide, or other material of equivalent strength.

Section 139.

a. Crawling boards, ladders or chicken ladders shall be used wherever necessary to provide protection against slipping or falling. Cleats shall be provided on crawling boards securely fastened thereto, not less in size than 1x3 inches and shall project approximately two and one-half (2½) inches on each side of the board.

b. Where crawling boards are used in pairs astride the apex of a roof, they shall be securely bolted together by a hinge bolt or provided with hooks, bolts or solidly fastened cleats on the underside at the upper end to catch over the ridgepole or shall be otherwise substantially secured.

BOATSWAIN'S CHAIR

Section 140.

a. A boatswain's chair shall provide a seat for a single occupant to perform work from a sitting posture in the chair, and a sling threaded through holes in each corner of the seat, to cross diagonally beneath the seat; each of four parts of equal length converging at the most convenient point above the seat, where the parts shall be joined to form a suitable loop or eye into which shall be engaged the means for suspending and hoisting, lowering or hauling the chair into desired positions.

b. The equipment, the chair and the object from which they are to be suspended shall be thoroughly inspected before using.

c. A life belt shall be used when practical.

Section 141. The dimension of the seat shall be not less than one by twelve by twenty-four (1x12x24) inches; holes shall be bored in the seat with their centers two and one-half (2½) inches from the edge of each of the four corners; the holes to be beveled on the underside to ease the angles for the passage of the rope. Cleats one by two by twelve (1x2x12) inches shall be securely fastened to the underside of the seat across each end outside the bored holes. Cleats and seat shall be constructed of maple or other wood of equivalent strength.

Section 142. The sling shall be constructed of five-eighths (⅝) inch or larger Manila rope or of three-eighths (⅜) inch or larger steel wire rope. Manila rope ends, if brought together, shall be joined a short splice under the seat or spliced with an eye splice if joined to other parts. Wire rope shall be spliced in the same manner or joined with properly secured wire rope clamps.

Section 143. The use of permanent hoisting gear attached to stacks or other structures to support Boatswain's chair is prohibited.

Section 144. Manufacturers' standard chairs or other practically designed chairs may be used if complying with the specific requirements of Sections 11, 12 and 13, Chapter I.

CHAPTER IX

LADDERS

COMMERCIAL LADDERS

The species of wood used for ladders shall be in accordance with the following groupings and used as hereinafter specified:

GROUP 1	GROUP 2	GROUP 3
White Ash	Douglas Fir	Sitka Spruce
Hickory	Western Larch	Western Hemlock
Black Locust	Southern Yellow Pine	Norway Pine
White Oak		Noble Fir

NOTE: The woods listed above refer to American Standards Grouping.

Section 1. All ladders not specifically mentioned herein shall be of sufficient strength to have a factor of safety of two (2) for the load that will be placed upon them when in use. The lumber dimensions for all ladders given herein are minimum dressed.

Section 2. Wooden side rails shall be of sound material free from shakes, cross-grain, checks and decay. Knots shall not exceed one-half (½) inch in diameter and shall not be nearer than one-half (½) inch to the edge of the rail or three (3) inches of the rung. Woods used in side rails shall be of a species indicated under Group 2 or 3 or species equivalent thereto in strength.

Section 3. Wood rungs shall be of sound material, free from knots, shakes, cross-grain, large checks or decay. Woods used for rungs shall be of a species indicated under Group 1 or species equivalent thereto in strength and wear.

Section 4. All rungs shall be securely fastened and uniformly spaced not to exceed twelve (12) inches on center, except as hereinafter provided.

Section 5. All holes for wooden rungs in side rails shall be bored in accordance with one of the following methods:

a. Bored entirely through the side rails for seven-eighths (⅞) inch tenon, or

b. Blind boring will be permitted provided the tenon is not less than one (1) inch in length and seven-eighths (7/8) inch in diameter and/or extends to within three-sixteenths (3/16) inch of the outside of the rail.

Section 6. Ladders constructed of other materials or dimensions than specified herein may be used, provided the strength and rigidity of the ladders specified herein are maintained.

Section 7. Ladders which have developed defects shall be repaired or withdrawn from service. Cleats shall not be used to repair rung ladders.

Section 8. All ladders when in place shall have a substantial bearing for all rails at the bottom and when inclined shall have a substantial support at or near the top.

Section 9. All portable ladders, shall be equipped with safety shoes, metal spikes or spurs, whichever is applicable to the condition under which the ladder is being used. Safety shoes shall be surfaced with cork, carborundum, rubber, or other material with equivalent coefficient of friction.

EXCEPTION: Step ladders, when used as such, lashed ladders and ladders provided with hooks at the topmost portion of the ladder and hooked securely to an object above.

Section 10. All ladders with spreading bases such as step and trestle ladders shall be equipped with spreaders to hold bases rigid when in open position. Material used in spreaders shall be equal in strength to one-eighth (1/8) by one-half (1/2) inch steel.

Section 11.

a. All fixed ladder landings shall be equipped with standard guard rails and toe boards so arranged as to give the safest possible access to the ladder. Such platform shall be not less than twenty-four (24) inches in width.

b. At least one rail of fixed ladders to landings shall extend a distance of at least thirty-six (36) inches above the landing. The rungs may be omitted above the landing. Where an employee must step a greater distance than fourteen (14) inches from ladder to roof, tank, etc., a landing shall be provided.

c. The vertical landing distance shall not be greater than the rung spacing of the ladder.

Section 12. If fixed ladders are used to ascend to heights exceeding thirty (30) feet, a landing or rest platform shall be provided for each thirty (30) feet or major fraction thereof unless provided with a confined climbing

space. This section shall not apply to water towers, masts, smokestacks, material hoists or towers.

Section 13. Ladders shall not be placed in front of door openings unless the door is securely fastened open, closed and locked or otherwise effectively guarded.

Section 14. Single ladders not constructed to be used as sectional ladders shall not be spliced together to form a longer ladder.

Section 15. Warning signs, barricades or other effective means shall be provided to prevent the displacement of ladders placed in dangerous zones or in public thoroughfares.

Section 16. Construction ladders shall be provided and maintained in place during working hours until temporary or permanent stairways are ready for use.

Section 17. The use of single rail ladders is prohibited except as provided in Section 139, Chapter VIII.

RECOMMENDATION: Portable ladders should, where possible, be used at such a pitch that the horizontal distance from the top support to the foot of the ladder is one-quarter (¼) the unsupported length of the ladder rails, unless the ladder is lashed or otherwise held in position to prevent slipping.

Section 18. The following types of ladders shall be constructed in accordance with the following schedules:

(a) SINGLE LADDERS

Side rails and rungs shall have a minimum dressed cross section of the following dimensions:

LENGTH	RAIL SECTIONS	RUNGS
Up to and including 16'	1-5/16"x2-½"	1-⅛"
Over 16' up to and including 20'	1-5/16"x2-¾"	1-⅛"
Over 20' up to and including 24'	1-5/16"x3"	1-⅛"

1. The minimum width between the side rails at the base, inside to inside, shall be at least 11½ inches for all ladders up to and including ten (10) feet. Such minimum widths shall be increased at least one-quarter (¼) inch for each additional one foot of length.
2. Rungs shall not exceed twenty-eight (28) inches in length.
3. Masons' single ladder up to twenty-two (22) feet in length shall

have side rail cross section of one and five-eighths (1⅝) inches by three and three-quarters (3¾) inches. The rungs shall be not less than one and three-eighths (1⅜) inch in diameter with a one (1) inch tenon. Rungs shall be uniformly spaced not less than eight (8) or more than twelve (12) inches apart.

(b) EXTENSION LADDERS

TOTAL LENGTH OF TWO SECTIONS	CROSS SECTION OF RAILS GROUP 2 WOODS	DIAMETER OF RUNGS
Up to and including 30'	1-5/16"x2-½"	1-⅛"
Over 30' up to and including 40'	1-5/16"x2-¾"	1-⅛"
Over 40' up to and including 44'	1-5/16"x3"	1-⅛"
	GROUP 3 WOODS	
Up to and including 28'	1-5/16"x2-½"	1-⅛"
Over 28' up to and including 32'	1-5/16"x2-¾"	1-⅛"
Over 32' up to and including 36'	1-5/16"x3"	1-⅛"
Over 36' up to and including 44'	1-3/8" x3"	1-⅛"

1. The following is the minimum overlap for extension ladders:

SIZE OF LADDER (FEET)	OVERLAP (FEET)
Up to and including 36'	3
Over 36' up to and including 44'	4

NOTE: The size of extension ladders is designated by the sum of the lengths of the sections measured along the side rails.

2. Ladders longer than 44 feet shall be made up of more than two sections and shall have side rails of proportionately larger dimensions.

3. Extension ladders shall be equipped with two (2) positive locks, either automatic or gravity type, on each extension of malleable iron or equivalent material and of such construction as to make the extension ladder equal in strength to a ladder constructed of continuous side rails.

4. All other metal parts of the ladder shall be of malleable or wrought iron or equivalent material.

5. Ladders of this type may be equipped with a rope and pulley which shall be securely attached to the ladder in such manner as not to weaken either rungs or the side rails. The pulley shall not be less than one and one-quarter (1¼) inches in diameter.

6. Masons' extension ladder shall be limited to two (2) sections and to forty-four (44) feet in length, and shall have side rails one and three-eighths (1⅜) by four (4) inches. Width of bottom section shall be not more than twenty (20) inches; rungs not less than one and one-fourth (1¼) inches in diameter and tenon one (1) inch in diameter.

7. Wood rungs and their mountings shall conform to the requirements of Sections 3 to 5, Chapter IX, inclusive.

(c) STEP LADDERS

1. Step ladders shall be of either Type-I or Type-II, constructed of either Group 2 or Group 3 woods with the following minimum dimensions of the parts or equivalent strength thereof, as follows:

TYPE I LADDER

	Length 12 Feet and Less		Length 14 to 20 Feet	
	Thickness (Inch)	Depth (Inches)	Thickness (Inches)	Depth (Inches)
Side Rails	25/32	3-¼	1-1/16	3-¼
Back Legs	25/32	2-¼	1-1/16	2-¼
Steps	25/32	3-¾	25/32	4-¼
Top	25/32	6	25/32	6

TYPE II LADDER

	Length 4 to 10 Feet		Length 12 Feet	
	Thickness (Inch)	Depth (Inches)	Thickness (Inch)	Depth (Inches)
Side Rails	25/32	2-⅝	25/32	3-¼
Back Legs	25/32	1-¾	25/32	1-¾
Steps	25/32	3-½	25/32	3-⅝
Top	25/32	5-½	25/32	5-½

2. The minimum thickness of side rails for both Type-I and Type-II ladders provides for the cutting of grooves one-eighth (⅛) inch in depth and shall be increased when grooves of greater depth are used.

3. If flat steps are used, each step shall be secured with at least two (2) 6-d nails at each end or the equivalent thereof. Each step shall be reinforced by a commercial three-sixteenths (3/16) inch steel rod which shall pass through metal washers of sufficient thickness and diameter on each end to prevent pressing into the side rails and a truss block which shall be fitted between the rod and the center of each step; or by a metal angle brace on each side firmly secured to the steps and side rails; or by construction of equivalent strength. Where rod construction is used, the bottom step shall be provided further with a metal angle brace on each side which shall be securely attached to the bottom step and side rails.

4. Back legs shall be substantially braced.

5. All step ladders shall be provided with spreaders as specified in Section 10, Chapter IX.

6. The type of step ladder to be used shall be of sufficient strength to carry the maximum working load to be imposed upon it.

(d) SECTIONAL LADDERS

1. Sectional ladders over thirty-seven (37) feet in extended working length shall not be used.

2. The connection joint shall be not less than one (1) foot. The grooved ends of the sections shall be reinforced with a metal plate not less than 18 U. S. Standard Gauge properly secured thereto and riveted above the groove extending through the depth of the rail or other equivalent fastening.

3. The minimum dressed cross section and distance between side rails shall be as follows:

	Side Rails Cross Section		Distance Base (Inches)
	Thickness (Inches)	Depth (Inches)	
Up to and including 4 sections	1⅛	2¾	13
Over 4 sections up to and including 6	1⅛	3⅛	20

4. If the length of sections exceed six (6) feet the side rail cross sections shall be correspondingly increased.

5. Wood rungs and their mountings shall conform to the requirements of Sections 3 to 5, Chapter IX, inclusive.

(e) TRESTLE AND EXTENSION TRESTLE LADDERS

1. Trestle ladders over sixteen (16) feet in length shall not be used, either as single trestles or the base of an extension ladder.

2. Trestle ladders and base sections of extension trestle ladders shall be so spread that when in an open position the spread of the trestle at the bottom, inside to inside, shall be at least five and one-half (5½) inches per foot of the length of the ladder.

3. The width between the side rails of the trestle ladders and base section of extension trestle ladders shall be at least twenty-one (21) inches for all ladders and sections up to and including six (6) feet. Longer lengths shall be increased not less than one (1) inch for each additional foot of length. The width between the side rails of the extension section of the trestle ladders shall be not less than eleven and one-half (11½) inches.

4. The tops of the side rails of the trestle ladder and of the base section of the extension trestle ladder shall be beveled, or equivalent construction and shall be provided with a metal spreader and/or a locking device equal to strength to one-eighth by one-half (⅛x½) inch steel, properly coated and protected so as to be rust-resistant.

5. Side rails for all trestle ladder sections up to sixteen (16) feet in length shall be one and five-sixteenths by two and three-quarters (1-5/16x2-¾) inches, minimum dressed.

6. Rungs for all trestle ladder sections shall be as specified in Section 3, Chapter IX and shall be installed as specified in Sections 4 and 5, Chapter IX. The rungs shall be parallel and level and spaced not less than eight (8) inches or more than eighteen (18) inches apart; on the extension section of the extension trestle ladder, rungs shall be spaced not less than six inches or more than twelve (12) inches apart.

7. The lumber for the side rails of all trestle ladder sections shall be of a grade not less than Group 3, as specified in Section 2, Chapter IX.

8. The locking device for securing the extension section to the base

section shall be of substantial construction so as to make the extension section equal in strength to a ladder constructed of continuous side rail.

9. No trestle ladder extension shall be greater than the following:

TRESTLE BASE (FEET)	EXTEND TO (FEET)
6	10
8	14
10	18
12	21
14	25
16	28

NON-COMMERCIAL LADDERS

(f) SINGLE SECTION CLEAT CONSTRUCTION LADDERS

Length	Min. Inside Width	Max. Inside Width	Cross Section of Rails	Cross Section of Cleats
Up to 16'	20"	24"	2"x4"	1"x3"
More than 16' and up to 24'	20"	24"	2"x6"	1"x4"

1. The lumber dimensions given in the above table are commercial sizes.

2. Fixed ladders shall follow dimensions given for single cleat ladders and may exceed twenty-four (24) feet in height provided they are securely fixed or braced at intervals of not more than fifteen (15) feet.

3. If the required strength is provided by the use of heavier or stronger material a wider spread may be permitted.

4. Cleats shall be securely attached to the side rail section and shall have fillers between the cleats or unless side rails are notched for the cleats.

CHAPTER X

TEMPORARY FLOORS, STAIRS, RAILINGS, OVERHEAD AND UNDERFOOT PROTECTION, LIFE LINES AND SAFETY BELTS

Section 1. Temporary floors shall be provided in all structures for employees working on various floor levels and shall be of sufficient strength to support a minimum, uniform load of twenty-five (25) lbs. per square foot in such manner that the allowable stresses given in Section 7, Chapter I are not exceeded. The planks shall be placed as close together as possible, and shall not extend more than one (1) foot beyond supports unless securely fastened to prevent slipping or tipping. All planks shall project not less than four (4) inches beyond the inside face of the bearing unless securely fastened.

Section 2. When it is unnecessary for employees to work over the entire area of a floor, only such partial area on which it will be necessary for employees to work shall be provided with the temporary working floors as required in Section 1, Chapter X of this code. The temporary working floors shall be provided on the exposed sides with the standard guard rails and toe boards.

Section 3. All joists shall be securely fastened to prevent tipping before placing the temporary floors. Over joists upon which concrete floors are to be placed, expanded metal, metal lath or wire mesh, not greater than one-half (½) inch mesh, may be used where the joist spacing does not exceed twenty-four (24) inches, provided that all laps and joints are securely fastened and that plank runways are provided for the safe passage or working thereon by employees, as provided in Section 4 a. and b., Chapter VIII.

Section 4. In buildings or structures where the upper floors are constructed before the lower floors, temporary floors of the strength provided in Section 3, Chapter X shall be maintained not more than two floors below the floor being constructed.

Section 5. Structural steel frame buildings shall have temporary floors as provided in Section 1, Chapter X placed within two (2) typical floors of the erectors and the riveters. Such floors shall cover the entire floor area beneath riveters or erectors, except that no floors are required over hoistway or stairway openings. Safety belts or nets shall be provided and used where the construction does not permit the placing of the floors required above.

EXCEPTIONS: The provisions of this section shall not apply to what is generally known as mill buildings, where no floors are contemplated, and where the operation of overhead cranes, etc., will not permit.

Section 6. Reinforced concrete frame constructed buildings shall have

floor or concrete forms constructed before the forms of the story above are started.

Section 7. In sectionally constructed buildings each section constitutes a separate building operation in the application of the temporary floor requirements of this code.

Section 8. The foregoing requirements relating to temporary floors shall not apply to the erection or construction of towers, stacks or scaffolds.

OVERHEAD PROTECTION

Section 9. Overhead protection shall be provided by means of lumber or other material of strength and construction at least equivalent to two (2) inch plank. Such overhead protection shall not be required in private residence construction less than four (4) stories in height unless special hazards exist or develop in the course of such construction.

Section 10. Overhead protection shall be provided where employees are working below other employees on floor levels with open floor above as in large auditoriums or similar large apartments or rooms above and on operations on the outside of buildings or structures. Areas where there is danger of falling objects shall be railed off or otherwise guarded unless overhead protection is furnished.

EXCEPTION: This shall not apply to operations carried on in an ordinary enclosed room, nor to areas over which loads are swung by derricks, cranes or other similar equipment.

Section 11. Where it is impracticable to provide overhead protection as required by Section 9, Chapter X in the erection of structural steel or any other work where employees are required to work under unprotected overhead operations, the employer shall provide a safety helmet and it shall be the responsibility of the employee to wear such a helmet.

UNDERFOOT PROTECTION

Section 12. Protection in the form of temporary floors or platforms shall be provided for all employees where they are required to work over machinery in operation, open vats or hoppers, furnaces when in use, railroad tracks with moving equipment below the work, high tension electric wires, unless de-energized and properly grounded, or similar sources of danger. Where it is impracticable to furnish temporary floors or platforms for the hazards above mentioned, safety belts or life nets shall be provided and used.

Section 13. Where employees are exposed to drowning or other hazards, a sufficient number of life belts or life buoys with lines attached and in good

condition shall be kept easily accessible and in close proximity. Where any such work is on "deep or extensive water," a boat with an employee immediately available to man it, shall be provided for emergency use. It shall be fully equipped with lights, oars, lines, life belts or life buoys, and standard first-aid equipment shall be immediately at hand for emergency use. In crib enclosures or work of similar nature where employees are exposed to danger of falling inside of the enclosure, a life raft shall be provided. Life preservers may be furnished in lieu of the above equipment.

STAIRWAYS

Section 14. Buildings or other structures more than sixty (60) feet in height in which it is impracticable to install the permanent stairways for construction use, shall be provided with not less than one (1) temporary stairway of substantial construction between floors, fitted with not less than two (2) inch by eight (8) inch treads securely fastened in place. The runs or flights shall be built at angles not to exceed forty-five (45) degrees to the floors or other horizontal parts to which they connect or land. Where it is impracticable to provide temporary stairways due to the absence of floors in the structure, then fixed ladders shall be provided with rest platforms every thirty (30) feet, in accordance with Sections 11 and 12, Chapter IX.

Section 15. Permanent steel or other metal stairways with hollow pan-type treads that are to be filled with concrete or other materials, when used during construction, shall be filled to the level of the nosing with solid material. This requirement shall not apply during the period of actual construction of the stairways themselves.

Section 16. Stairways used for construction purposes shall be fitted with substantial and securely fastened treads and shall have tightly floored landings or gratings.

HANDRAILS

Section 17. Handrails shall be provided on the open sides of stairways and stair landings, except where such stairways and landings are protected by studding or other permanent construction.

Section 18. Handrails shall be not less than thirty-six (36) inches nor more than forty-two (42) inches in height measuring vertically from the center of the tread; with supporting uprights spaced not more than eight (8) feet on centers and both substantially constructed of not less than two (2) inch by four (4) inch timber or other material and spacing of equal strength and practicability.

Section 19. Provision shall be made to prevent the use of stairways not equipped as required in the preceding sections during construction operations.

LIFE NETS, SAFETY BELTS, LIFE LINES

Section 20. Life lines, safety belts and/or life nets shall be provided by the employer and it shall be the responsibility of the employee to wear or use such equipment when engaged in securing or shifting thrustouts, inspecting or working on overhead machines supporting scaffolds or other high rigging, on steeply pitched roofs, by painters at work on poles or steel frame construction and by all workmen exposed to the hazards of falling when the operation being performed is more than fifteen (15) feet above solid ground or above a permanent floor or platform, except where their use creates a greater hazard. The determination of a hazardous condition shall be made by employer and employee. If they fail to agree the Montana Industrial Accident Board shall render a final decision.

Section 21. Where employees are required to work from window ledges or similar locations, fifteen (15) or more feet above the ground, floor or similar elevation, they shall be provided with safety belts and it shall be the responsibility of the employee to wear such belt. Where it is impracticable to use safety belts in such locations, window jack scaffolds shall be provided for the use of employees.

Section 22. Life lines shall be securely fastened above the operation and shall extend below the operation a sufficient distance to permit a safe landing.

Section 23. The provisions of Sections 20 to 22, Chapter X, inclusive, requiring the use of life nets, safety belts and life lines shall not apply to rigging, the erection of hoists, towers, derricks, scaffolds, ladders, elevators, nor to the erection of structural steel in buildings or bridges if their use creates a greater hazard.

RECOMMENDATION: It is recommended and strongly urged that substantial safety belts with clincher tube or other similar device attached thereto which automatically operates and wedges itself with a jerk on the rope or by sudden weight coming upon it so that the wearer cannot fall, be provided by employers and used by employees in the erection or painting of structural steel in or on buildings, bridges, stacks, poles, steeples, or other similar hazardous operations.

CHAPTER XI

CUTTING AND WELDING

GAS WELDING AND CUTTING

Section 1. Only approved apparatus, such as torches or blow pipes, regulators or reducing valves, etc., shall be used.

Section 2. All cylinders used for the storage and shipment of compressed acetylene or oxygen shall be constructed and maintained in accordance with the specifications and regulations of the Interstate Commerce Commission.

NOTE: The abbreviated marking: "I.C.C.---", stamped upon cylinders shall be sufficient evidence of their compliance.

Section 3. Charged cylinders when not in use, shall not be stored near highly combustible material or near any heat radiating object, such as stoves, boilers, forges, etc. Oxygen cylinders shall not be stored near oil or grease.

Section 4. Inside of buildings, cylinders of oxygen shall not be stored close to cylinders of acetylene or other fuel gas; unless well separated there shall be a fire-resisting partition between oxygen cylinders and acetylene or other fuel gas cylinders.

Section 5. Cylinders being moved from one portion of a structure to another shall have valve protection caps in place, if provided. Where carriers are provided for moving cylinders which are connected for use, capping shall not be required but cylinder valves shall be closed and pressure released from regulators, hose and torches.

Section 6. When transporting cylinders by a crane or derrick, a cradle, boat or suitable platform shall be used. Valve-protecting caps shall be in place, when provided. The use of slings or electric magnets for transporting cylinders is prohibited.

Section 7. Acetylene or liquefied petroleum gas cylinders shall be used and stored in an upright position.

Section 8. Cylinders stored or in use on structures shall be lashed in place in an upright position.

Section 9. Fuel gas or oxygen shall not be withdrawn from cylinders for use in cutting or welding torches except through suitable regulators. Oxygen regulators shall not be used in fuel gas service and vice versa.

Section 10. Cylinder valves shall be shut and the pressure released from regulators, hose and torches when cylinders are connected to welding

or cutting equipment but not in use, unless work is to be stopped for a few minutes only, in which case it is permissible to close the torch valves only.

Section 11. When an acetylene or liquefied petroleum gas cylinder not provided with a fixed hand wheel is in use the cylinder valve key shall be left in place on the valve spindle.

Section 12. All torch operators engaged in welding or cutting metal coated with lead, cadmium, or mercury-bearing substances or containing lead, cadmium, beryllium or other metal producing toxic fumes, when subjected to high temperatures, shall be provided with an approved type air-line respirator or hose mask and it shall be the responsibility of the employee to wear the equipment provided, except where local exhaust ventilation sufficient to control the fumes generated is provided.

Section 13. Adequate local exhaust ventilation shall be provided when welding or cutting metals coated with zinc or zinc-containing substances or when using fluoride-bearing flux indoors.

Section 14. Exhaust ventilation shall not be substituted for required respiratory protection in welding or cutting operations covered by Sections 12 and 13, Chapter XI, when the operation is performed inside confined spaces.

Section 15. Fuel gas cylinders stored inside of buildings, except those in actual use or attached ready for use shall be limited to a total gas capacity of 2,000 cubic feet (250 lbs. of liquefied petroleum gas). In large, well ventilated, one-story buildings, special exceptions to this rule may be granted by the Industrial Accident Board of Montana.

Section 16. Hose connections for oxygen and acetylene shall be distinguished from each other. Oxygen and acetylene hose shall be of dissimilar colors or marked for identification.

Section 17. Any length of hose in which a flashback has occurred and burned in hose shall be taken out of service.

Section 18. A single hose having more than one gas passage, a wall failure of which would permit the flow of one gas into the other gas passage, shall not be permitted. However, hoses joined by a web so as to form integral lengths of double hose are acceptable provided that they are easily distinguished from each other.

Section 19. Screens, shields, or other suitable safeguards shall be provided when practicable, for the protection of workmen or combustible materials exposed to sparks or falling objects.

Section 20. Open flames of any kind are prohibited where cylinders are stored.

ARC WELDING

Section 21. Where arc welding is used in construction, only approved arc welding equipment shall be used.

Section 22. Frames of all electric arc welding machines operated from power circuits shall be effectively grounded with wire of not lighter than No. 8 American Standard Gauge. The ground shall be mechanically strong and electrically adequate for the service required.

Section 23. Electrode holder of adequate rated current capacity shall be insulated to protect the operator against possible shock.

Section 24. Screens, shields, or other safeguards shall be provided for the protection of men or combustible materials below or otherwise exposed to sparks or falling objects. When others must work nearby, they shall be protected from the arc rays by screens, or by other adequate individual protection.

Section 25. When welding sets operated by internal combustion engines are used in enclosed or confined spaces, suitable exhaust ducts shall be used for conducting exhaust gases to the outside atmosphere.

CHIPPING, CLEANING AND GRINDING

Section 26.

a. Gloves shall be worn to protect the hands and wrists.

b. The danger to other personnel in the area may require screening or shielding.

c. Workmen shall be cautioned to chip away from the face and to shield face with free hand.

d. Gloves shall be worn when wire-brushing weld metal.

e. When cleaning and brushing surfaces to be welded, caution shall be used to avoid metal slivers and sharp edges.

FIRE CONTROL

Section 27. A suitable fire extinguisher or other fire control device shall be ready for instant use in any location where welding is done. Where welding must be carried on near combustible materials, a helper, or other extra man if necessary, shall be on hand to guard against fire.

PERSONAL PROTECTION

Section 28.

a. Flame-resistant gauntlet gloves shall be worn except where welder is engaged in light work.

b. Flame-resistant aprons of leather, asbestos, or other suitable material shall be worn as protection against radiated heat and sparks.

c. Fire resistant leggings, high boots or other leg protection shall be required for very heavy work.

d. High quality welding helmets of glass fibre, vulcanized fibre, chrome leather or other suitable material shall be required. The proper shade of welding lens shall be required and an adequate supply of cover lenses shall be available. Handshields are generally substituted for helmets on light, intermittent work. Men assisting operator shall also wear protective lenses to avoid "welding flash" of eyes.

Safety goggles or spectacles shall be worn under the helmet during chipping and cleaning. These goggles shall have tinted lenses, affording ultra-violet and infra-red radiation protection.

e. Combination safety hats-welding helmets shall be required in special situations exposing welders to the hazards of falling objects from overhead.

CHAPTER XII

ELECTRICAL WIRES AND EQUIPMENT

Section 1. All electrical wiring used during construction shall be installed and maintained so as to protect workmen against injury.

Section 2. All machinery, equipment and hand tools, used in construction or demolition work, powered by electric current in excess of eighty (80) volts shall have all current-carrying wires, either temporary or permanent, substantially insulated and shall be provided with an effective ground.

Section 3. Main feed lines and secondary lines supplying current carrying 110 volts or over shall not be less than seven (7) feet above the floor or ground, unless run in rigid or otherwise approved conduit. Extension cords shall not be considered as secondary lines.

Section 4. Extension cords to lights or electrically operated tools or devices between connections and fittings shall be well insulated and maintained in a safe condition. These cords shall be made of heavy-duty cord or equal, with socket or non-conductive material.

Section 5. Wiring equipment such as fastenings, connections, etc., where accessible to workmen shall be non-conductive and/or where conductive equipment is used, the same shall be guarded so as to protect workmen against injury.

Section 6. No work shall be done on any wiring or equipment carrying 440 volts or over unless electricians' rubber gloves with protectors and/or other protective equipment such as blankets and line hose are provided by the employer, unless the circuits are de-energized and grounded. It shall be the responsibility of the employee to wear such protective equipment as is provided by the employer.

Section 7. The employer shall designate the person or persons who shall work on wiring or equipment carrying two hundred twenty (220) volts or more.

CHAPTER XIII

SPRAY PAINTING

Section 1. The employer shall provide efficient respirators or other effective equipment to protect spray paint operators and all other employees working within an area where the atmosphere is charged with spray coating mists when the work is being performed on buildings or other structures. It shall be the responsibility of the employee to wear the equipment provided by the employer to protect him from inhaling or swallowing spray coating mists.

Section 2. All spray machine operators shall be required to wear a garment, close fitting at the ankles, neck and wrists and shall also be required to wear gloves while engaged in spraying materials other than water paints.

Section 3. All spray operators shall cover all exposed parts of the body with vaseline, cold cream or some other suitable preparation while engaged in spraying materials other than water paints.

Section 4. Spray coating with flammable materials shall not be performed where the mist area is exposed to fire or electrical arcs. Smoking in such areas shall be prohibited.

Section 5. Containers (other than mixing and working pots or drums) of flammable painting and finishing materials shall be closed except when their contents are being withdrawn and they shall be placed or stored where they will not be exposed to excessive heat, flames, sparks or direct sunrays.

Section 6. The wet process shall be substituted for the dry process in removing painted surfaces whenever practicable.

Section 7. All moving parts of spray painting equipment shall be guarded as provided in Sections 1 to 8, Chapter II, inclusive.

Section 8. If ladders are used in connection with spray painting they shall conform to the requirements of Sections 1 to 18, Chapter IX, inclusive.

Section 9. If scaffolds are used in spray painting they shall conform to the requirements of such scaffolds as covered in Sections 1 to 144, Chapter VIII, inclusive.

CHAPTER XIV

GENERAL REQUIREMENTS

1.1 Employees shall report to their employers the existence of any unsafe equipment or any other hazards which may come to their knowledge.

1.2 Employees shall use all herein required safety devices furnished by the employer.

1.3 No protective equipment or safety device shall be removed or made ineffective without the authority of the employer or his authorized representative.

1.4 Drivers of trucks, especially those returning to the work, shall be instructed to reduce the speed and shall give alarm signals when approaching between employees or in the immediate proximity of employees at work.

2.1 When a question arises as to which of several employers shall furnish or maintain the protection herein required, it shall be the duty of each employer to furnish and maintain such protection for his own employees.

2.2 Any employer who permits or allows his employee to use any equipment of another, shall be responsible for the construction and guarding of such equipment insofar as the provisions of this code are applicable.

3.1 Stacked material shall be so piled and removed as reasonably to safeguard employees against injury caused by falling of the material. Employees shall so remove material as not to undermine the piles.

3.2 Defective load carrying equipment shall be repaired or replaced. Any equipment removed as defective shall be so marked.

4.1 All permanent and temporary floors shall be kept reasonably free from debris and upturned nails.

4.2 All stairways, corridors, passageways, ramps, runways and platforms shall be kept reasonably free from loose material and debris.

4.3 All work places, stairways, corridors and passageways where workmen must frequent, pass or use in the performance of their work or in the

passage to and from their work, shall be kept reasonably lighted, except as otherwise provided for in this code.

5.1 Oily or used paint and finishing wipers shall be rendered proof against spontaneous or other combustion by submerging the wipers in water until they can be disposed of.

5.2 Where drop cloths are used they shall be reasonably clean and shall be provided by the employer.

5.3 On any operation in which an unusual fire hazard exists for personnel, a fire blanket, fire extinguishers, or other effective fire extinguishing agent shall be provided by the employer.

6.1 Salamanders, stoves or other types of heating devices that give off noxious fumes shall be hooded and piped to the outside of the building and so constructed or anchored in such a manner as will prevent tipping or overturning.

7.1 Safe drinking water shall be provided by the employer. The use of common drinking cups or dippers is prohibited. Where fountain or fountain type container is not available, a supply of paper drinking cups shall be furnished by the employer.

7.2 Reasonable washing facilities shall be provided by the employer for all employees.

7.3 On every construction operation sufficient toilet facilities shall be provided, and so constructed that the occupants thereof shall be shielded from view and protected against the weather and falling objects, and maintained as sanitary as local conditions will permit.

7.4 When practical and where warranted, suitable quarters shall be provided to protect health, safety and welfare of employees and the same shall be kept clean and sanitary.

8.1 Hammocks or stretchers, to properly handle injured employees shall be provided on all large operations.

8.2 Adequate provisions for the first-aid treatment of injured persons shall be maintained for every job at all times and at least one person shall be assigned first-aid responsibilities. Such materials shall be kept in a sanitary and usable condition. A frequent inspection shall be made of all first-aid materials, which shall be replenished as necessary. A 24-unit kit is the minimum suitable requirement for up to 50 workmen or as directed by a doctor who understands the needs of the job. (First-aid kits may be dispensed with where separate hospital room, emergency or dressing station in charge of an attendant is provided for use of employees who are injured.)

At least one person shall be trained in the latest methods of first-aid and shall be assigned first-aid responsibilities at any isolated project where fifteen or more men are employed. "Doctor", "Hospital", and "Ambulance" telephone number and address shall be posted in a conspicuous place. Provisions must be made in advance for prompt medical attention in case of serious injury.

Employees shall seek first-aid or medical treatment immediately upon receiving an injury and shall report all injuries to their supervisor promptly.

8.3 The use of hard-toed safety shoes is strongly recommended for all employees subject to foot injuries caused by materials dropped on feet. Special shoe types or designs may be required where conditions exist that make their use necessary to the safety of employees.

8.4 The requirements for flagmen shall comply with the Standard Specifications for Road and Bridge Construction, Montana Highway Commission.

8.5 The current Atomic Energy Commission regulations governing standards for protection against radiation shall apply.

RECOMMENDED: Employers shall arrange shifts so that no employee shall be required to work alone at any time unless he is in close contact with other employees.

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TABLE I — Structural Lumber—Unit Working Stresses

IN POUNDS PER SQUARE INCH

SPECIES	Bending Extreme Fiber		Horizontal Shear	Compression Perpendicular to Grain		*Compression Parallel With Grain	
	Dry	Wet	Dry or Wet	Dry	Wet	Dry	Wet
Ash White	1,120	800	100	500	300	880	720
Beech and Birch, Yellow	1,200	800	100	500	300	960	720
Cedar—Red	720	600	64	200	125	560	520
Cedar—White	600	480	56	175	100	440	360
Chestnut	760	560	72	300	150	640	480
Cypress—Southern	1,040	720	80	300	200	880	640
Douglas Fir—Coast Region	1,200	800	72	345	215	880	680
Hemlock Western	1,040	720	60	300	200	720	640
Hickory	1,520	960	112	600	350	1,200	800
Maple—Sugar or Black	1,200	800	110	500	300	960	720
Oak—White or Red	1,120	800	100	500	300	800	640
Pine—Norway	880	640	68	300	150	640	560
Pine—White, Yellow and Sugar	720	600	68	250	125	600	520
Pine—Southern, Yellow Dense	1,400	935	103	380	235	1,020	800
Poplar—Yellow	800	640	64	250	125	640	480
Redwood	960	640	56	250	125	800	600
Spruce—Red, White or Sitka	880	640	68	250	125	640	520
Tamarack—Eastern	960	720	76	300	200	800	640

*These stresses are for short columns in which "L" is less than 15d. For longer columns the allowable stress equals allowable bending stress from the table times $1 - \frac{L}{60d}$, in which L is length of column; d is least dimension.

ALLOWABLE LOAD TABLES—PLANKS, BEAMS AND COLUMNS.

Tables I and II give the allowable total loads, uniformly distributed, for the more common stock sizes of lumber used as planks and beams for various span lengths. Table III gives the allowable total loads for stock sizes of lumber used as columns with square bearing and central loads. Where these conditions do not exist, proper provisions for eccentric loading shall be made in determining the safe load for the column. The allowable loads in Tables I, II and III are based on an extreme fiber stress of 1,000 pounds per square inch and the allowable load for lumber for any unit stress other than 1,000 pounds may be readily obtained by proportion. The allowable loads as given by the Tables or proportioned therefrom shall not be exceeded.

The formulas used in determining the allowable loads in Tables I and II are as follows:

FORMULAS FOR CALCULATIONS

Formula for Bending $W = \frac{BD^2}{9L}F$ Formula for Shear $W = \frac{4BDS}{3}$

Legend:

W—Allowable total load in pounds uniformly distributed
B—Breadth of beam in inches
D—Depth of beam in inches
L—Length of span in feet
F—Extreme fiber stress in bending in pounds, per square inch
S—Allowable shear in direction of grain in pounds, per square inch

Column Formula 10/12 $C = F\left(1 - \frac{L}{600}\right)$

Applies only where column height is 15 or more times the least dimension of the column.

Legend:

C—Allowable unit compressive stress per square inch
F—Extreme fiber stress in bending in pounds per square inch
L—Effective length of column in inches
D—Least dimension of column in inches

TABLE II

Allowable Loads for Planks—In Pounds

Total allowable uniformly distributed loads for timber planks supported at ends. The allowable concentrated load shall be one-half the distributed load.

Based on unit stress of 1,000 pounds per square inch.

	PLANKS							
Nom. Size Inches	6x2	8x2	10x2	12x2	14x2	8x3	10x3	12x3
Actual Size Inches	5⅝x1⅝	7½x1⅝	9½x1⅝	11½x1⅝	13½x1⅝	7½x2⅝	9½x2⅝	11½x2⅝
Area Sq. In.	9.25	12.20	15.45	18.70	21.95	19.70	25.0	30.2
Span in Feet								
4	410	550	700	850	990	1440	1820	2200
5	330	440	560	680	790	1150	1460	1770
6	280	370	470	560	660	960	1220	1470
7	240	320	400	480	570	820	1040	1260
8	210	280	350	420	500	720	910	1100
9	180	250	310	380	440	640	810	980
10	------	220	280	340	400	580	730	880
11	------	200	250	310	360	520	660	800
12	------	180	230	280	330	480	610	740
13	------	------	220	260	310	440	560	680
14	------	------	200	240	280	410	520	630
15	------	------	180	230	270	380	490	590
16	------	------	------	210	250	360	460	550
17	------	------	------	200	240	340	430	520
18	------	------	------	190	220	320	400	490
19	------	------	------	------	210	300	380	460
20	------	------	------	------	200	290	370	440

TABLE III

Allowable Loads for Beams—In Pounds

Allowable uniformly distributed loads for timber beams supported at ends.
The allowable concentrated load shall be one-half (½) the distributed load.

Based on unit stress of 1,000 pounds per square inch.

	BEAMS								
Nom. Size Inches	2x4	2x6	2x8	2x10	2x12	2x14	4x4	4x6	6x6
Actual Size Inches	1⅝ x3⅝	1⅝ x5⅝	1⅝ x7½	1⅝x9½	1⅝x11½	1⅝x13½	3⅝ x3⅝	3⅝ x5⅝	5½x5½
Area Sq. In.	5.90	9.15	12.20	15.45	18.70	21.95	13.15	20.4	30.2
Span in Feet									
4	600	1430	2540	4070	5970	8230	1330	3190	4600
5	480	1140	2030	3260	4780	6580	1060	2550	3690
6	400	950	1700	2720	3980	5490	890	2120	3080
7	340	820	1450	2320	3410	4700	760	1820	2630
8	300	710	1270	2040	2990	4110	660	1590	2300
9	------	630	1130	1810	2650	3660	590	1420	2050
10	------	570	1010	1630	2390	3290	530	1270	1840
11	------	520	920	1480	2170	3000	480	1160	1670
12	------	470	840	1360	1990	2740	440	1060	1530
13	------	------	780	1250	1840	2530	------	980	1410
14	------	------	720	1160	1710	2350	------	910	1310
15	------	------	670	1090	1590	2190	------	850	1220
16	------	------	630	1020	1490	2060	------	800	1150
17	------	------	------	960	1400	1930	------	750	1080
18	------	------	------	900	1320	1820	------	710	1020
19	------	------	------	860	1260	1730	------	670	970
20	------	------	------	810	1200	1640	------	640	930
*Allowable Load for Shear at 100 lbs./sq. in.	800	1230	1640	2080	2520	2950	1770	2740	4050

*Allowable load for any other value of unit shear may be obtained by proportion.

TABLE IV

Allowable Loads for Columns—In Pounds

Based on unit stress of 1,000 pounds per square inch

	COLUMNS						
Nom. Size Inches	2x4	2x6	2x8	4x4	4x6	6x6	8x8
Actual Size Inches	1⅝x3⅝	1⅝x5⅝	1⅝x7½	3⅝x3⅝	3⅝x5⅝	5½x5½	7½x7½
Area Sq. In.	5.90	9.15	12.20	13.15	20.4	30.2	56.2
Unbraced Height in Feet							
4	3,000	4,600	6,200	------	------	------	------
6	1,500	2,400	3,200	8,800	13,700	------	------
8	100	150	200	7,300	11,400	21,400	------
10	------	------	------	5,900	9,100	19,200	41,000
12	------	------	------	4,400	6,900	17,100	38,000
14	------	------	------	3,000	4,700	14,800	35,000
16	------	------	------	1,500	2,300	12,700	32,000
18	------	------	------	------	------	10,400	29,000
20	------	------	------	------	------	8,300	26,000

Allowable loads given in this table are for column lengths where $\frac{L}{D}$ exceeds 15 and are computed by the formula

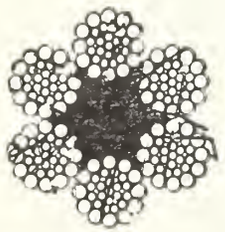
$$W = \text{Area} \times 1{,}000 \left[1 - \frac{L}{60d} \right]$$

For shorter columns, allowable loads are obtained as product of column area and allowable compressive stress.

TABLE V

Allowable Working Loads

6 x 37 FIBER CORE



Data applies to 6 x 37 classification ropes with fibre cores, preformed or non-preformed, including ropes from 6 x 29 to 6 x 61 constructions.

Rope Dia. in Inches	Approx. Weight Per Ft. in Lbs.	SHEAVE DIAMETER IN INCHES*		BRIGHT STERLING STEEL		BRIGHT PLOW STEEL		GALVANIZED STERLING STEEL		GALVANIZED PLOW STEEL	
		Recommend 27 x Rope Dia.	Minimum 18 x Rope Dia.	Breaking Strength in Tons	Working Load* in Tons	Breaking Strength in Tons	Working Load* in Tons	Breaking Strength in Tons	Working Load* in Tons	Breaking Strength in Tons	Working Load* in Tons
1/4	0.10	7	4 1/2	2.59	0.52	2.25	0.45	2.33	0.47	2.02	0.40
5/16	.16	8 1/2	5 1/2	4.03	.81	3.50	.70	3.63	.72	3.15	.63
3/8	.22	10	7	5.77	1.15	5.02	1.00	5.19	1.04	4.52	.90
7/16	.30	12	8	7.82	1.56	6.80	1.36	7.04	1.41	6.12	1.22
1/2	.39	13 1/2	9	10.2	2.04	8.85	1.77	9.18	1.84	7.96	1.59
9/16	.49	15 1/2	10	12.9	2.58	11.2	2.24	11.6	2.32	10.1	2.02
5/8	.61	17	11 1/2	15.8	3.16	13.7	2.74	14.2	2.84	12.3	2.47
3/4	.87	20 1/2	13 1/2	22.6	4.52	19.6	3.92	20.3	4.07	17.6	3.53
7/8	1.19	23 1/2	16	30.6	6.12	26.6	5.32	27.5	5.51	23.9	4.79
1	1.55	27	18	39.8	7.96	34.6	6.92	35.8	7.16	31.1	6.23
1 1/8	1.96	30	20	50.1	10.0	43.5	8.70	45.1	9.02	39.1	7.83
1 1/4	2.42	34	23	61.5	12.3	53.5	10.7	55.3	11.1	48.1	9.63
1 3/8	2.93	37	25	74.1	14.8	64.5	12.9	66.7	13.3	58.0	11.6
1 1/2	3.49	41	27	87.9	17.6	76.4	15.3	79.1	15.8	68.8	13.7
1 5/8	4.09	44	29	103.	20.6	89.3	17.9	92.7	18.5	80.4	16.1
1 3/4	4.75	48	32	119.	23.8	103.	20.6	107.	21.4	92.7	18.5
1 7/8	5.45	51	34	136.	27.2	118.	23.6	122.	24.5	106.	21.2
2	6.20	54	36	154.	30.8	134.	26.8	139.	27.7	121.	24.1
2 1/8	7.00	57	38	173.	34.6	150.	30.0	156.	31.1	135.	27.0
2 1/4	7.85	61	41	193.	38.6	168.	33.6	174.	34.7	151.	30.2
2 1/2	9.69	68	45	236.	47.2	205.	41.0	212.	42.5	184.	36.9
2 3/4	11.72	75	50	284.	56.8	247.	49.4	256.	51.1	222.	44.5
3	13.95	81	54	335.	67.0	291.	58.2	301.	60.3	262.	52.4
3 1/4	16.37	88	59	390.	78.0	339.	67.8	351.	70.2	305.	61.0
3 1/2	19.00	95	63	449.	89.8	390.	78.0	404.	80.8	351.	70.2

TABLE VI

Types of Poles Scaffolds and Material Dimensions	Stone Masons 75 lbs.	Brick Layers 50 lbs.	Lathers Plasterers Stucco 30 lbs.	Carpenters Miscl. 20 lbs.	Painters and Decorators 20 lbs.
Poles	4"x4"	2"x6"	2"x6"	2"x4"	2"x4"
Ledgers when used	2"x8"	2"x8"	1"x6"	----------	----------
*Stringers	1"x6"	1"x6"	1"x6"	1"x4"	1"x4"
Bearers	4"x4"	4"x4"	2"x6"	1"x8"	2"x6"
Putlogs	4"x4"	4"x4"	----------	----------	----------
Putlogs on edge nailed	2"x6"	2"x6"	2"x6"	----------	----------
Braces	1"x6"	1"x6"	1"x6"	1"x4"	1"x4"
Spacing Poles (Longitudinal)	7'-0"	8'-0"	8'-0"	8'-0"	8'-0"
Spacing Poles (Transverse)	5'-0"	5'-0"	5'-0"	5'-0"	7'-0"
Spacing Ledgers (Vertical)	4'-6"	4'-6"	6'-3"	7'-0"	7'-0"
Spacing Putlogs or Bearers—Same as Pole Spacing					
Planking	2"x10"	2"x10"	1¼"x12" Net	2"x8"	2"x10"
Toe Boards	2"x6"	2"x6"	----------	1"x6"	----------
Tote boards nailed in Center	1"x8"	1"x8"	----------	----------	----------

NOTES:

(1) Scaffolds over 25 feet and up to 64 feet in height:

Stone Masons' Poles	4"x6"
Bricklayers' Poles	4"x4"
Plasterers' Poles	4"x4"
Carpenters' and Miscl. Poles	2"x6"
Painters' Poles	2"x6"

(2) *Members which do not carry putlog or bearer load are designated as stringers.

(3) Pole scaffolds over 64 feet in height shall be so built that the working stresses in the members shall not exceed the allowable unit stresses as given in Section 7, Chapter I of this code.

(4) Guard rails, toe boards, side screens and overhead protection shall be provided on the exposed side of all pole scaffolds as required in Sections 26 to 31, Chapter VIII, inclusive.

(5) Pole scaffolds for work heavier than stone mason's shall have a factor of safety of not less than four (4) for the imposed load.

(6) If the spacing of the poles as shown in the above schedules is increased, the sizes of members shall be increased to conform with the allowable loads and stresses as provided in the tables, Section 7, Chapter I and Section 25, Chapter VIII.

(7) If ledgers or bearers are removed, adequate cross-bracing shall be provided to maintain the strength and rigidity required by the schedules.

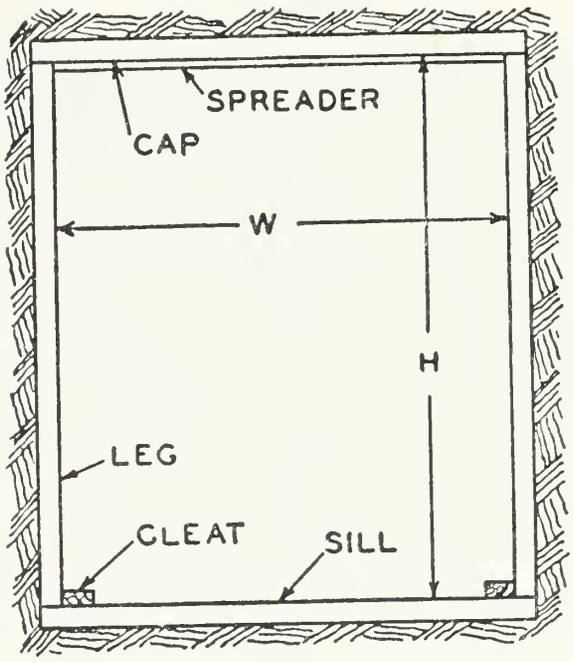


Fig. 1 BOX TYPE OF TIMBERING

Width Maximum in Feet W	Height Maximum in Feet H	Dimensions of Timbering		
		Caps, Legs, Sills Thickness in Inches	Spreaders (One to every set) Inches	Cleats Inches
3	4	2	1x4	2x4
5	6	3	1x4	2x4

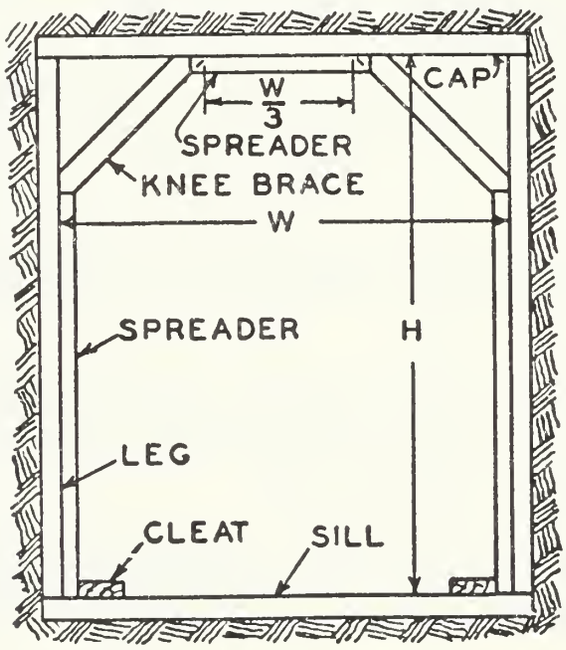


Fig. 2 BOX TYPE OF TIMBERING

Width Maximum in Feet W	Height Maximum in Feet H	Dimensions of Timbering		
		Caps, Legs, Sills, Knee Braces, Thickness in Inches	Spreaders (One to every set) Inches	Cleats Inches
8	8	3	2x6	2x6
10	10	4	2x6	2x6

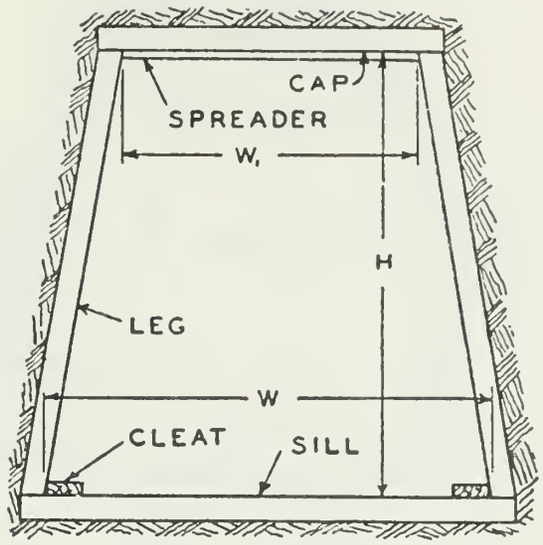


Fig. 3 MODIFIED BOX TYPE OF TIMBERING

Width Maximum in Feet		Height Maximum in Feet	Dimensions of Timbering		
W_1	W	H	Caps, Legs, Sills Thickness in Inches	Spreaders (One to every set) Inches	Cleats Inches
3	5	4	2	1x4	2x4
5	7	7	3	2x6	2x6
8	10	10	4	2x6	2x6

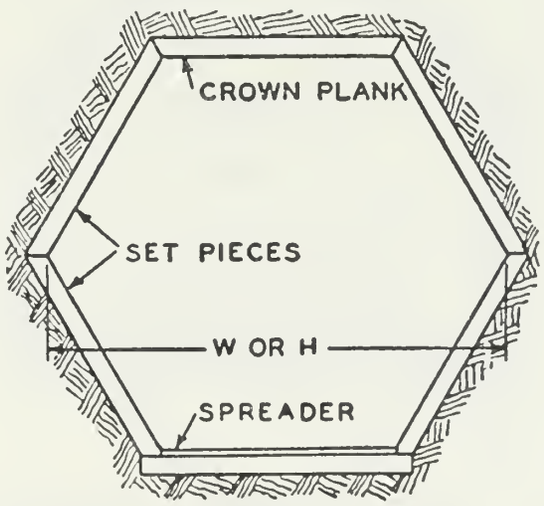


Fig. 4 HEXAGONAL TYPE OF TIMBERING

Width Maximum in Feet W	Height Maximum in Feet H	Dimensions of Timbering	
		Crown Planks, Set Pieces, Sills Thickness in Inches	Spreaders (One to every set) Inches
10	10	3	2x6

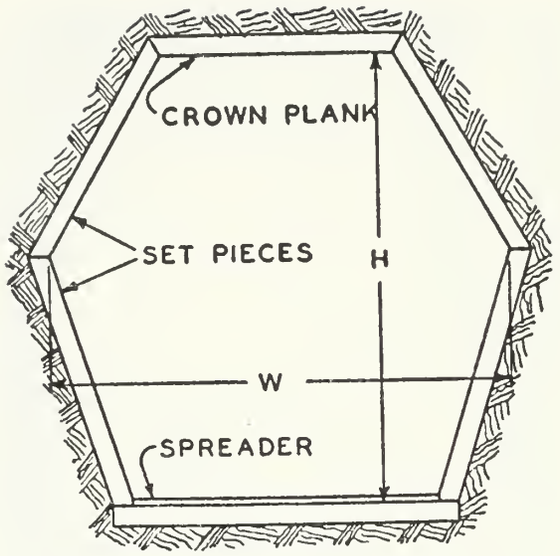


Fig. 5 MODIFIED HEXAGONAL TYPE OF TIMBERING

Width Maximum in Feet W	Height Maximum in Feet H	Dimensions of Timbering	
		Crown Planks, Legs, Haunch Pieces, Sills, Thickness in Inches	Spreaders (One to every set) Inches
10	10	3 (1)	2x6

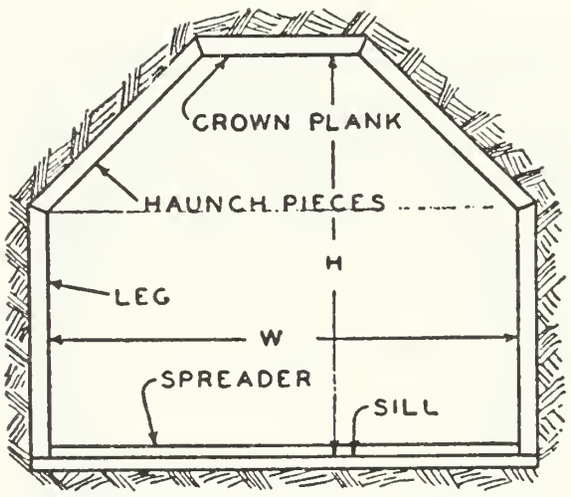


Fig. 6 ARCHED 6-PIECE TIMBER SET

Width Maximum in Feet W	Height Maximum in Feet H	Dimensions of Timbering	
		Crown Planks, Legs, Haunch Pieces, Sills Thickness in Inches	Spreaders (One to every set) Inches
5	6	3 (1)	2x6
10	10	3 (1)	2x6

(1) Use 4 inch plank if length of any piece exceeds 6 feet.

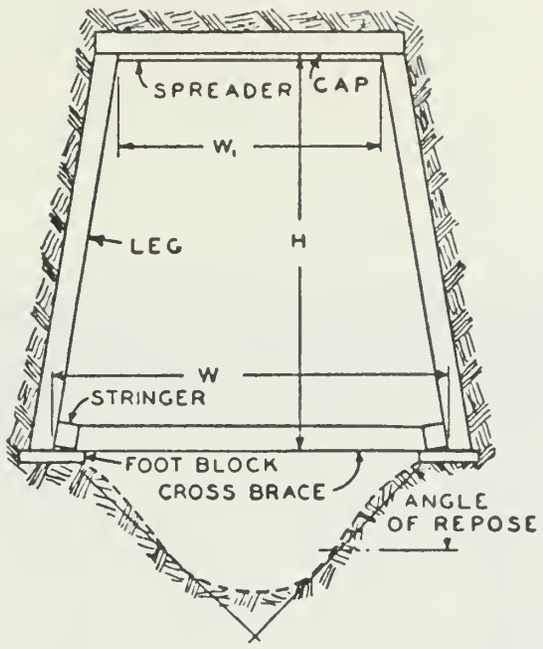


Fig. 7 CAP AND LEG TYPE OF TIMBERING

Width Maximum in Feet		Height Maximum in Feet	Dimensions of Timbering			
W_1	W	H	Caps, Legs, Thickness in Inches	Stringers Cross Braces (4 feet c—c) Inches	Spreaders (One to every set) Inches	Foot Blocks Inches
3	5	4	2	4x6	1x3	2x6x12
5	7	7	3	4x6	2x6	3x8x12
8	10	10	4	4x6	2x6	4x12x12

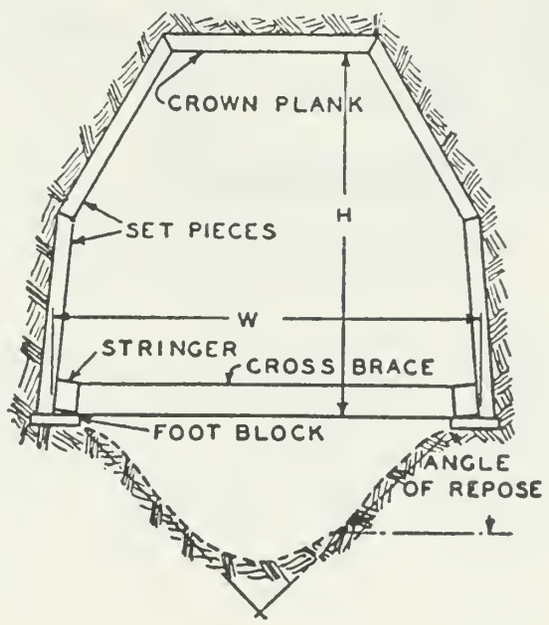


Fig. 8 ARCHED 5-PIECE TIMBER SET

Width Maximum in Feet W	Height Maximum in Feet H	Dimensions of Timbering		
		Set Pieces Inches	Stringers Cross Braces (4 feet c—c) Inches	Foot Blocks Inches
10	10	3	4x6	3x8x12

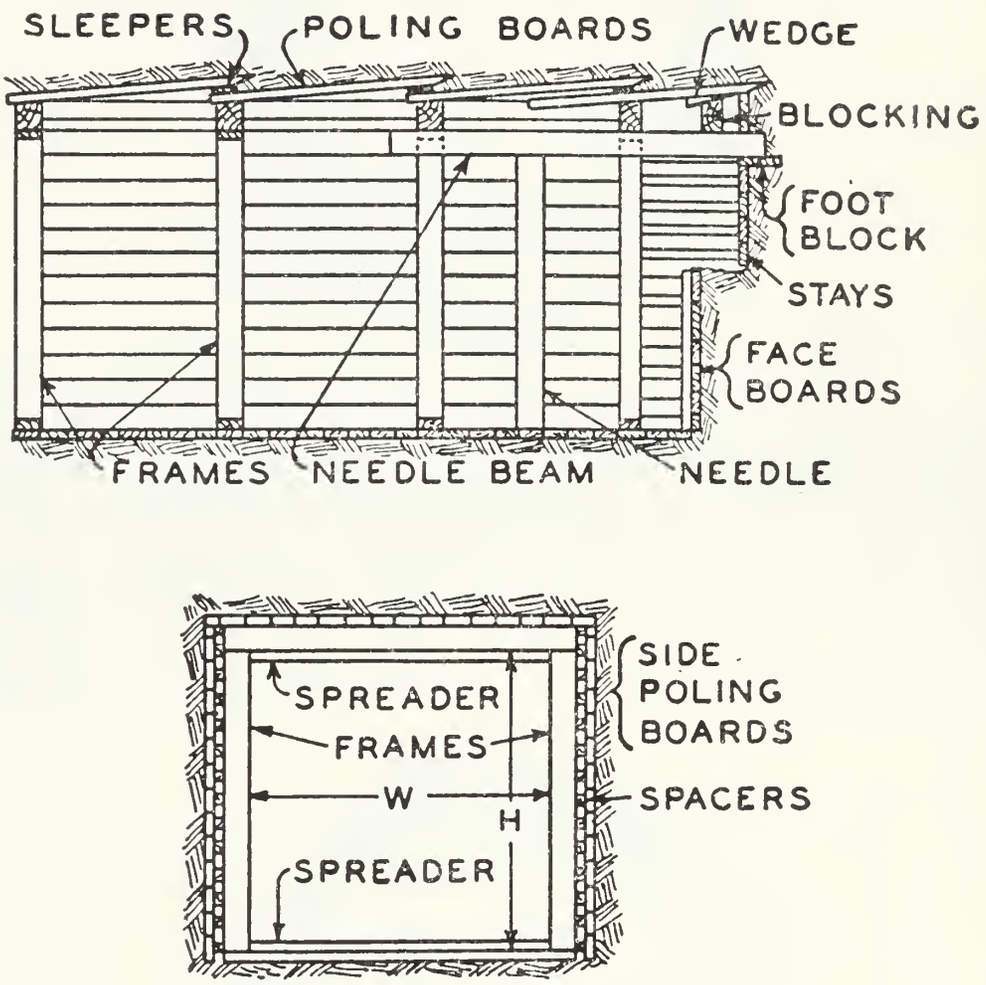


Fig. 9 POLING BOARD METHOD OF TIMBERING

Width Maximum in Feet W	Height Maximum in Feet H	Sheathing Thickness in Inches	Framing Timbers	
			Dimensions in Inches	Maximum Spacing in Feet
5	5	2	6x6	4
7	7	2	8~8	4
8½	8½	3	10x10	4
10	10	3	10x10	3½

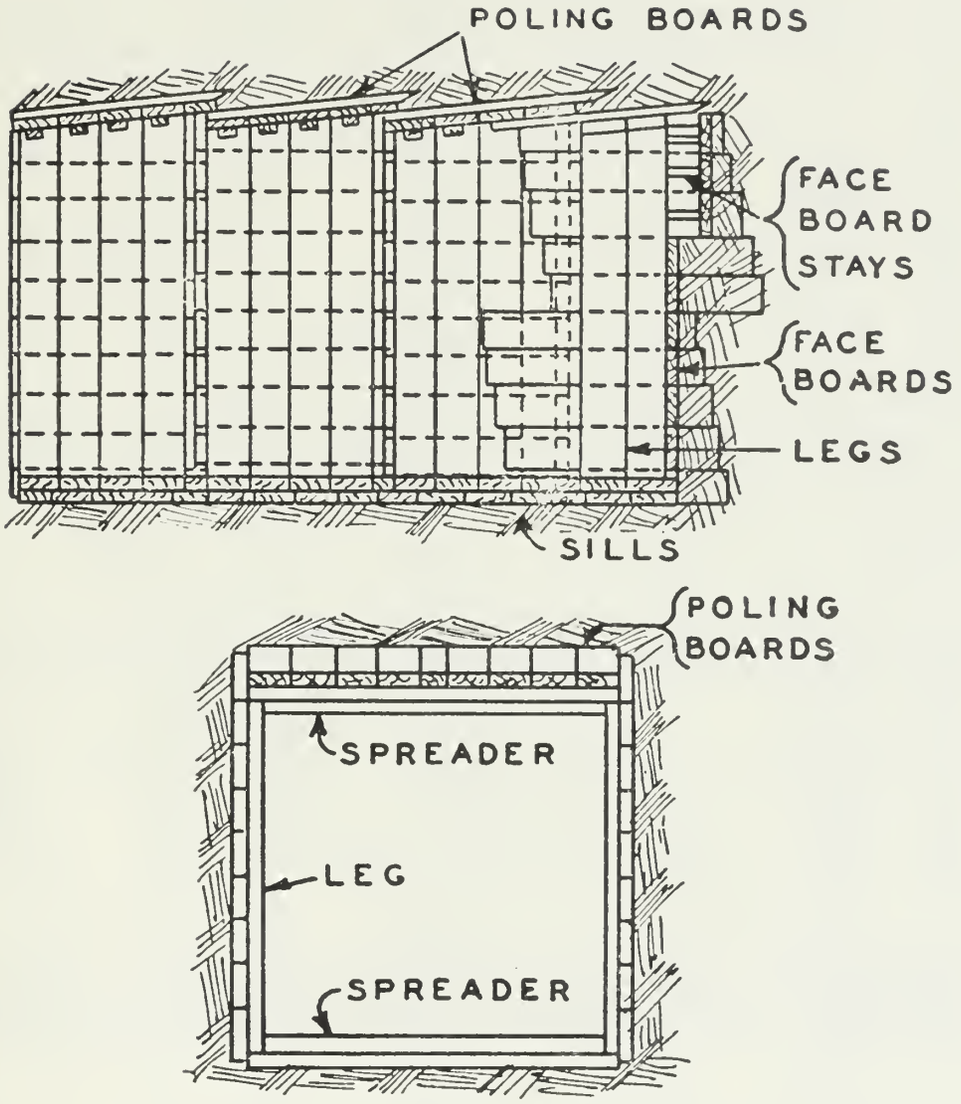
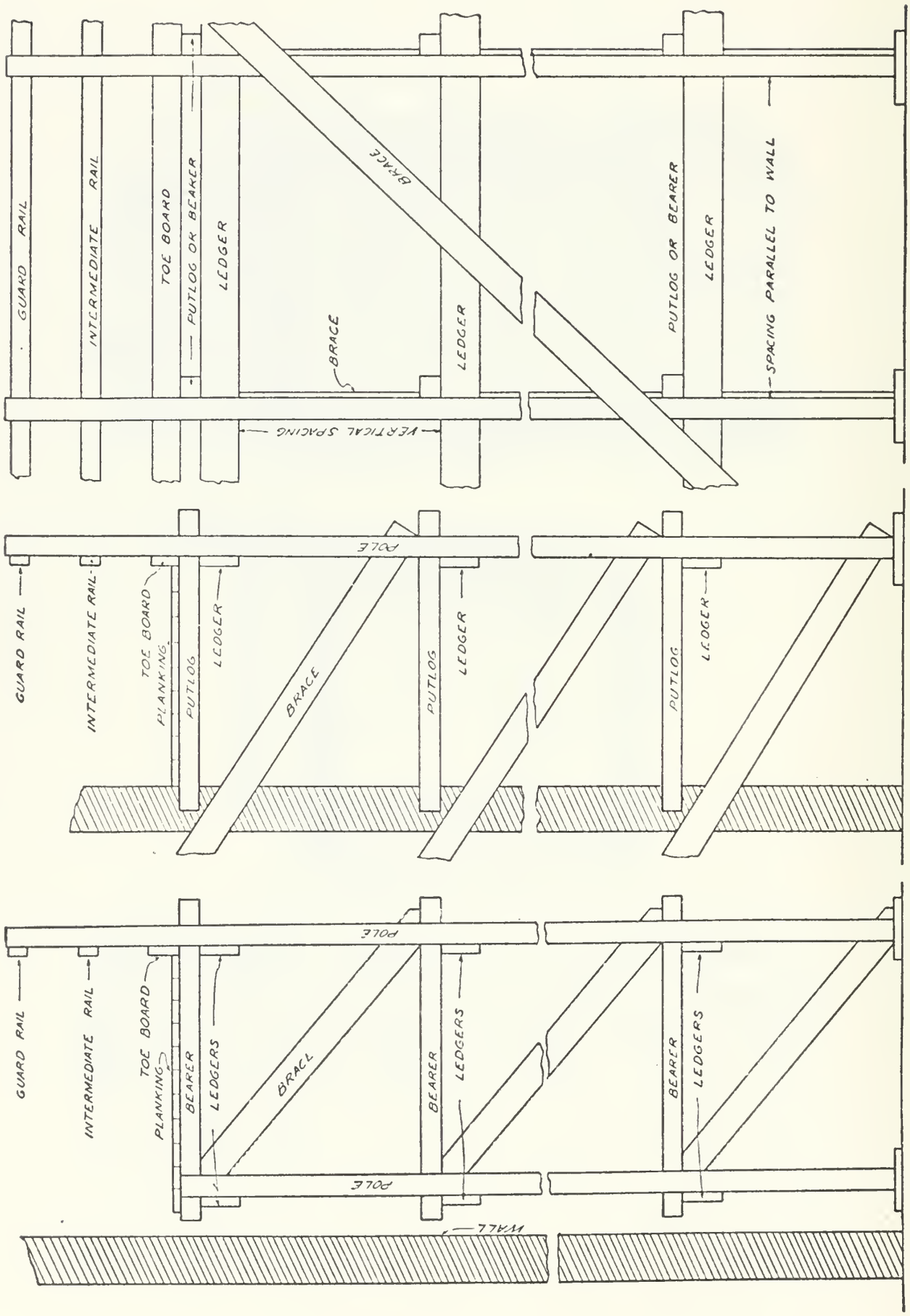


Fig. 10 POLING BOARD METHOD OF TIMBERING

Width Maximum in Feet W	Height Maximum in Feet H	Sheathing Thickness in Inches	Set Pieces Thickness in Inches	Spreaders Inches	Cleats Inches	Knee Braces Inches
4	3	1	2	1x4	2x4	..
5	6	1	3	2x6	2x4	..
8	8	2	3	2x6	2x6	3
10	10	2	4	2x6	2x6	4

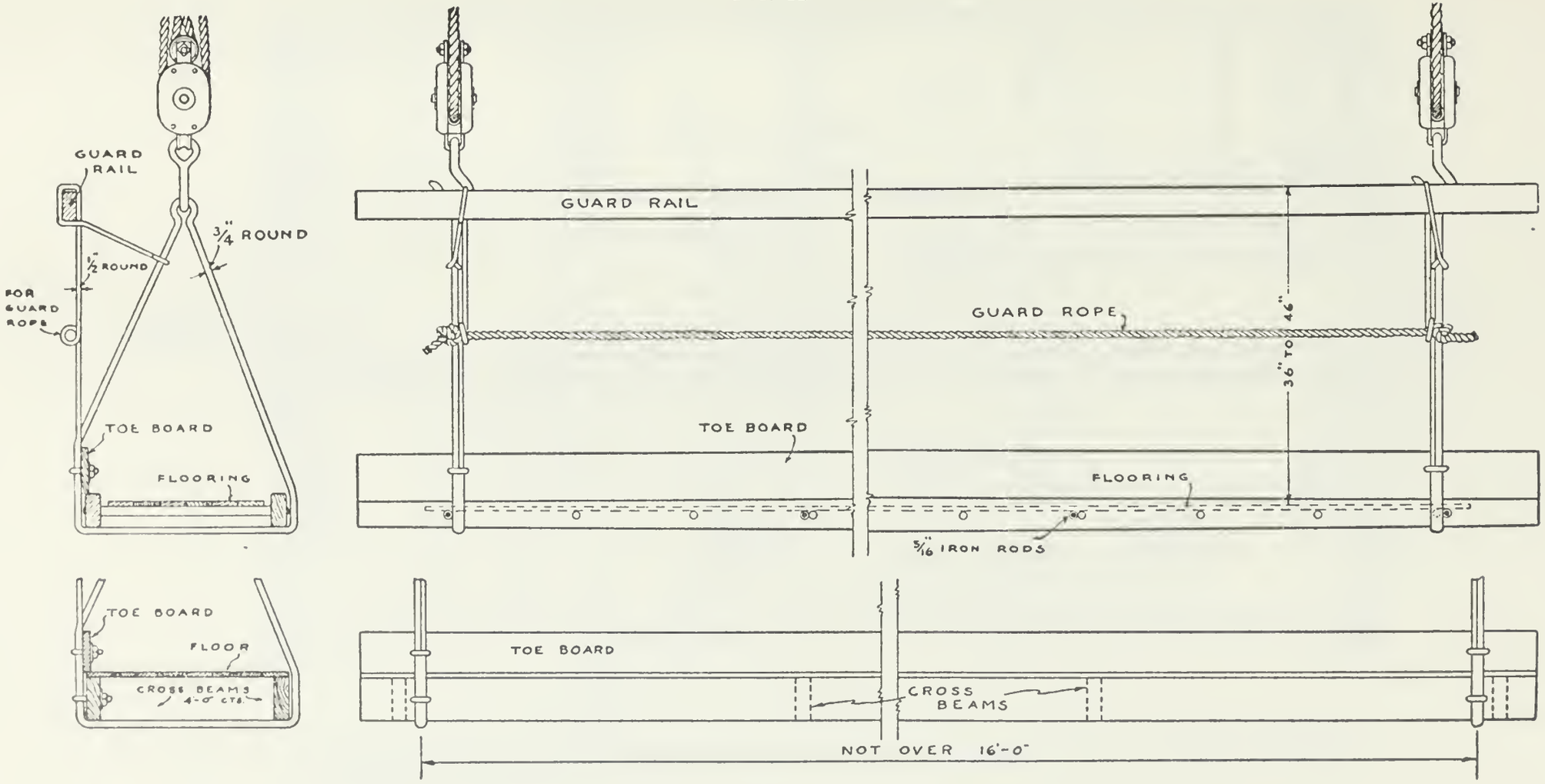
POLE SCAFFOLD—SINGLE AND DOUBLE TYPE

FIG. 11



SWINGING SCAFFOLD—LADDER PLATFORM AND LONGITUDINAL BEAM TYPE

FIG. 12



SPECIAL SWINGING SCAFFOLD—FOR SETTING STONE ABOVE FOUR STORIES

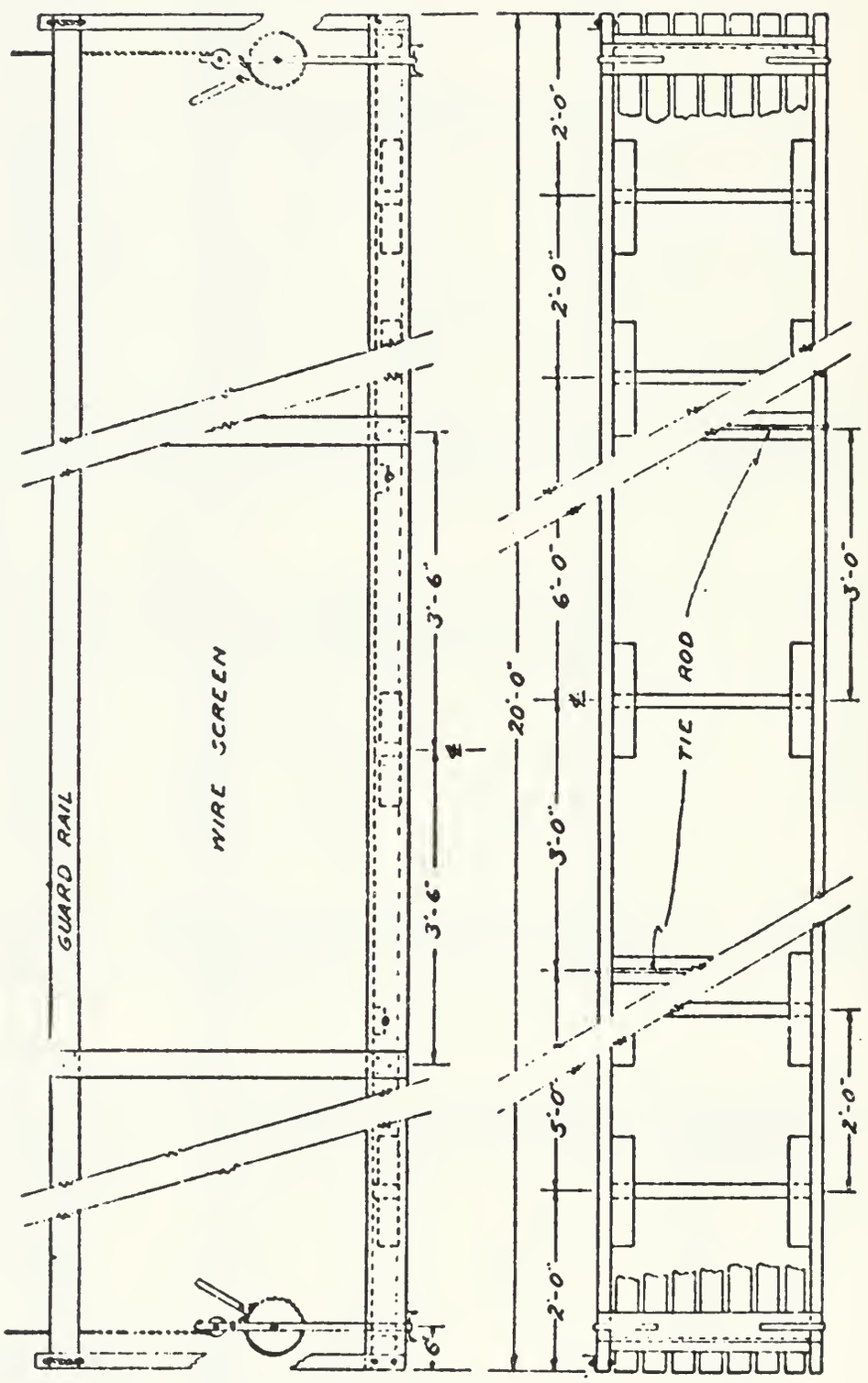
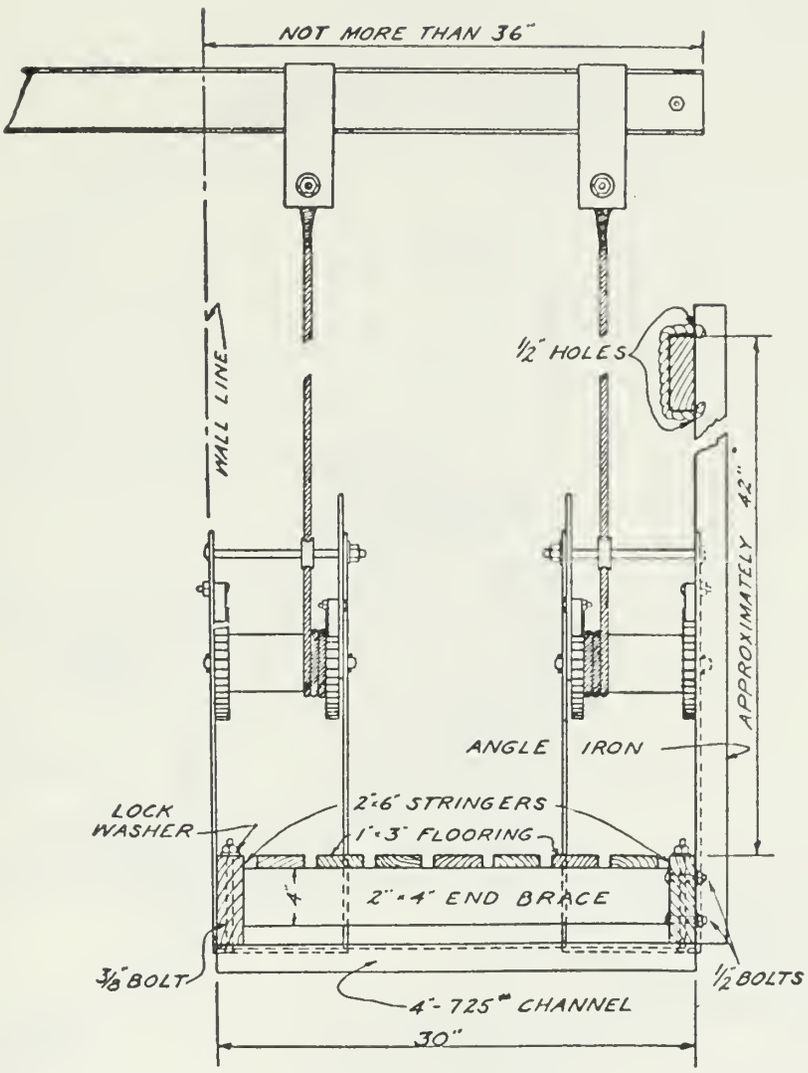


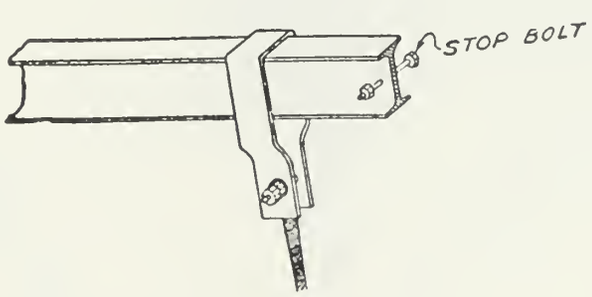
FIG. 13

FIG. 13A



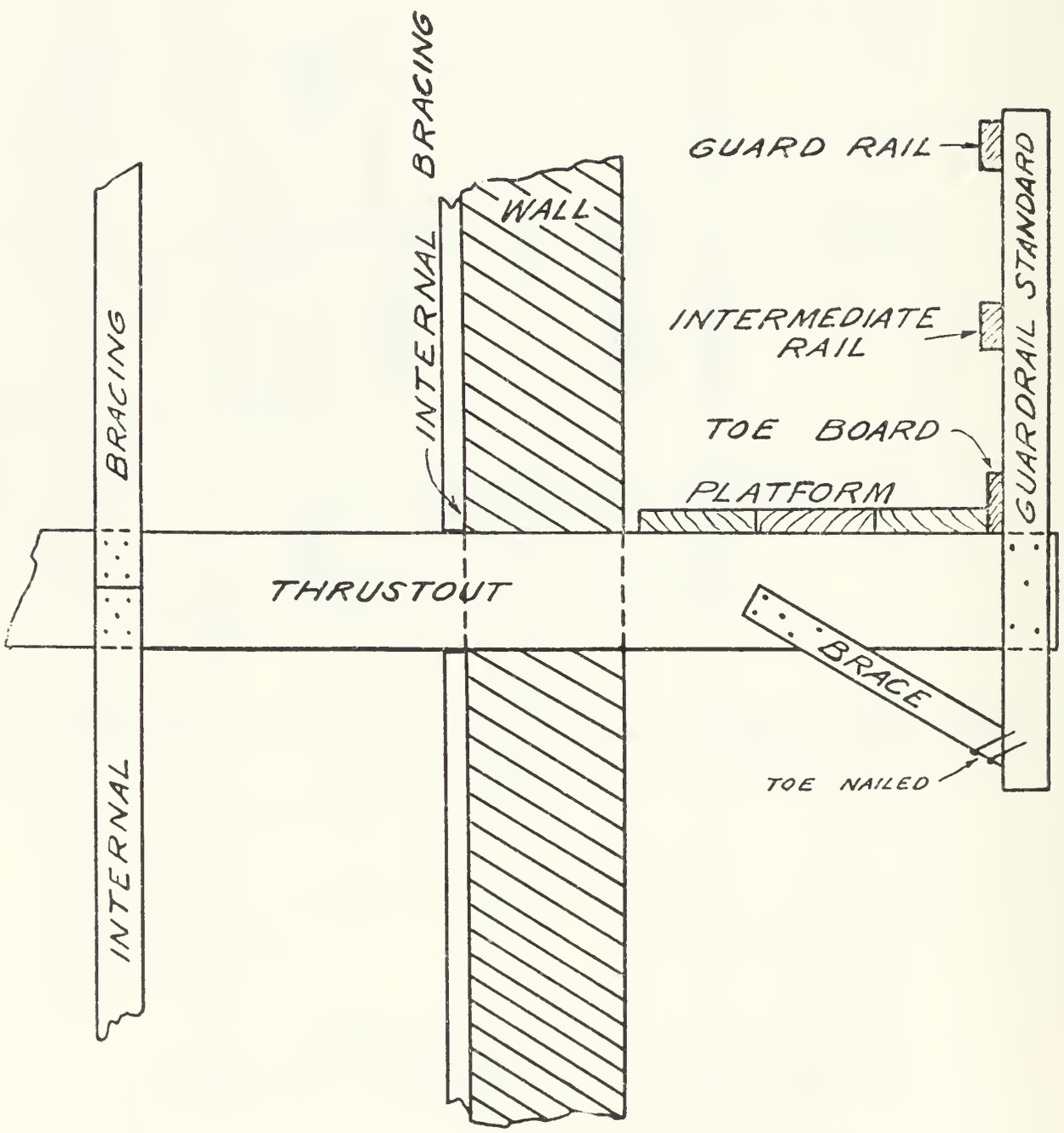
END VIEW OF SPECIAL SWINGING SCAFFOLD—FOR SETTING STONE ABOVE FOUR STORIES

FIG. 13B



OUTRIGGER SCAFFOLD

FIG. 14



SCAFFOLD HORSE AND FRAME

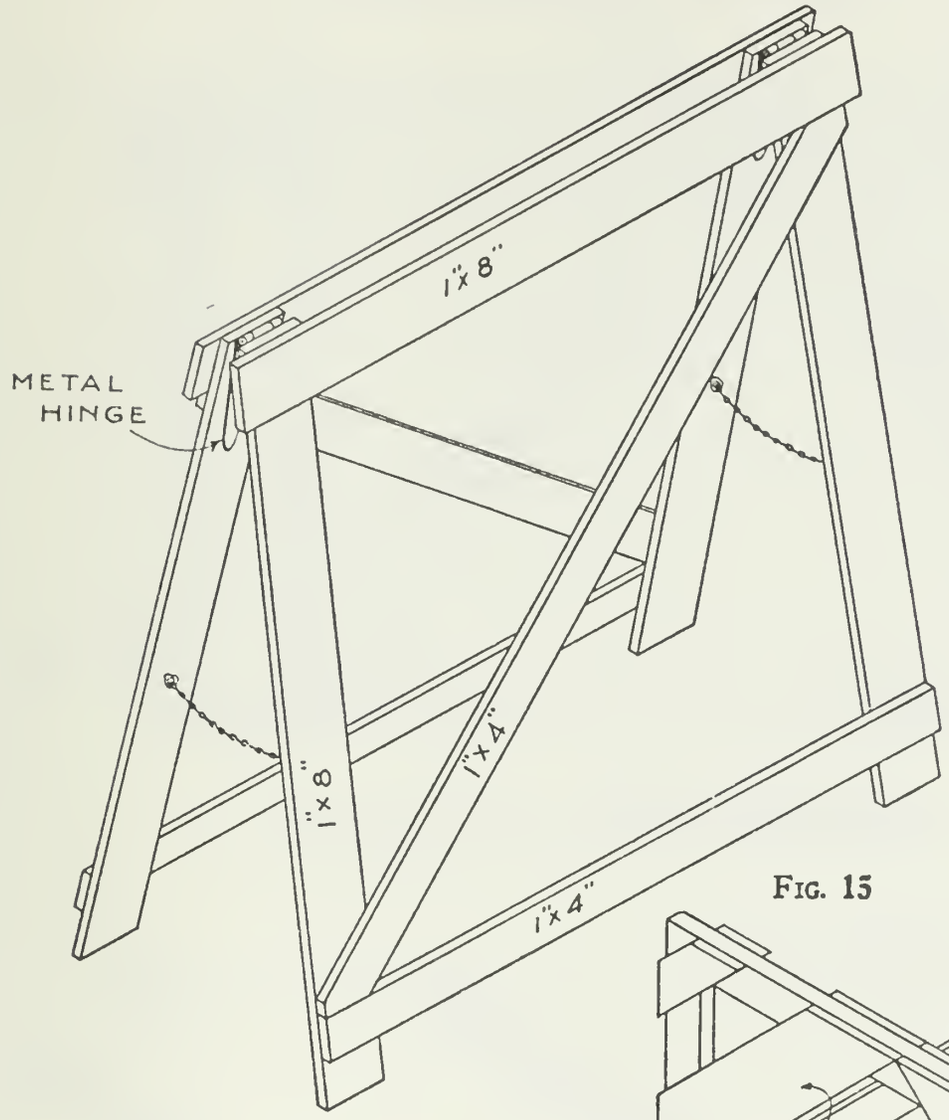
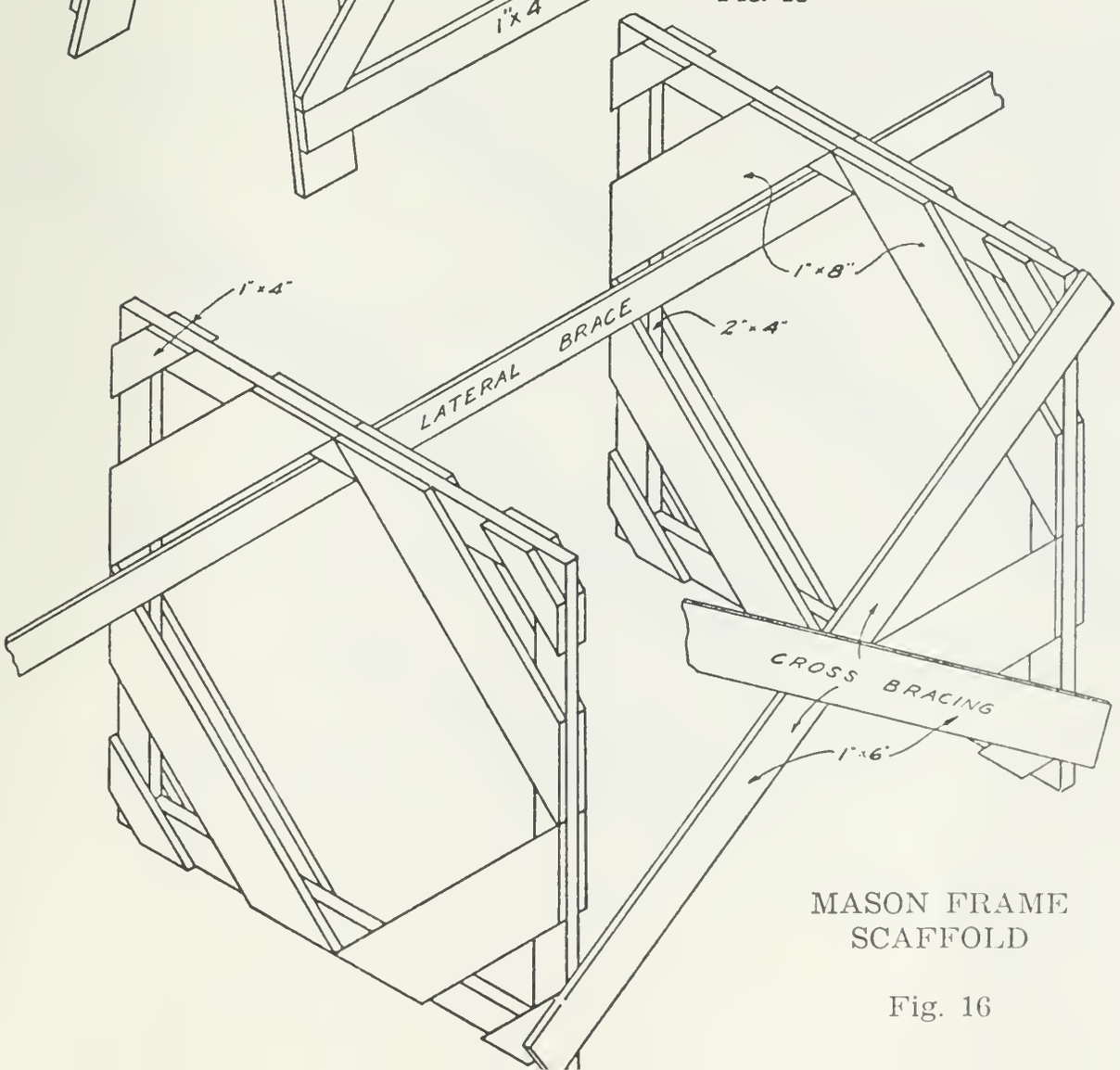


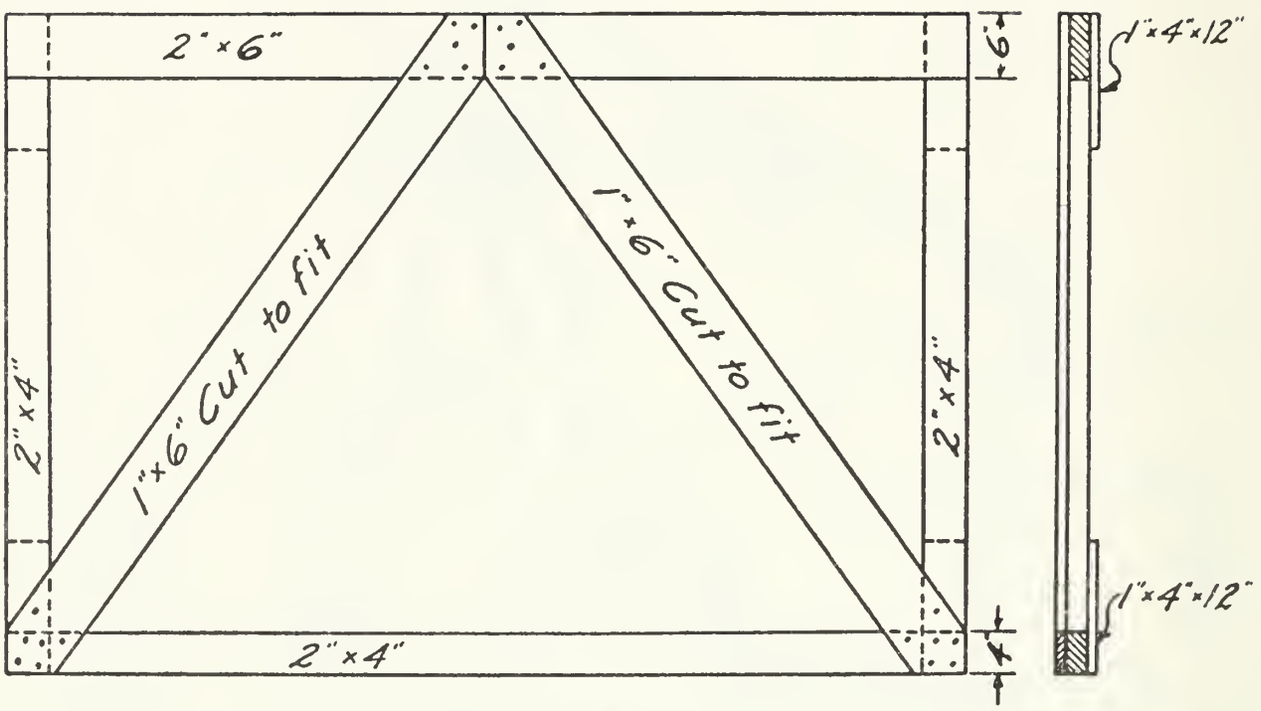
FIG. 15



MASON FRAME
SCAFFOLD

Fig. 16

FIG. 17



Scaffold Jack

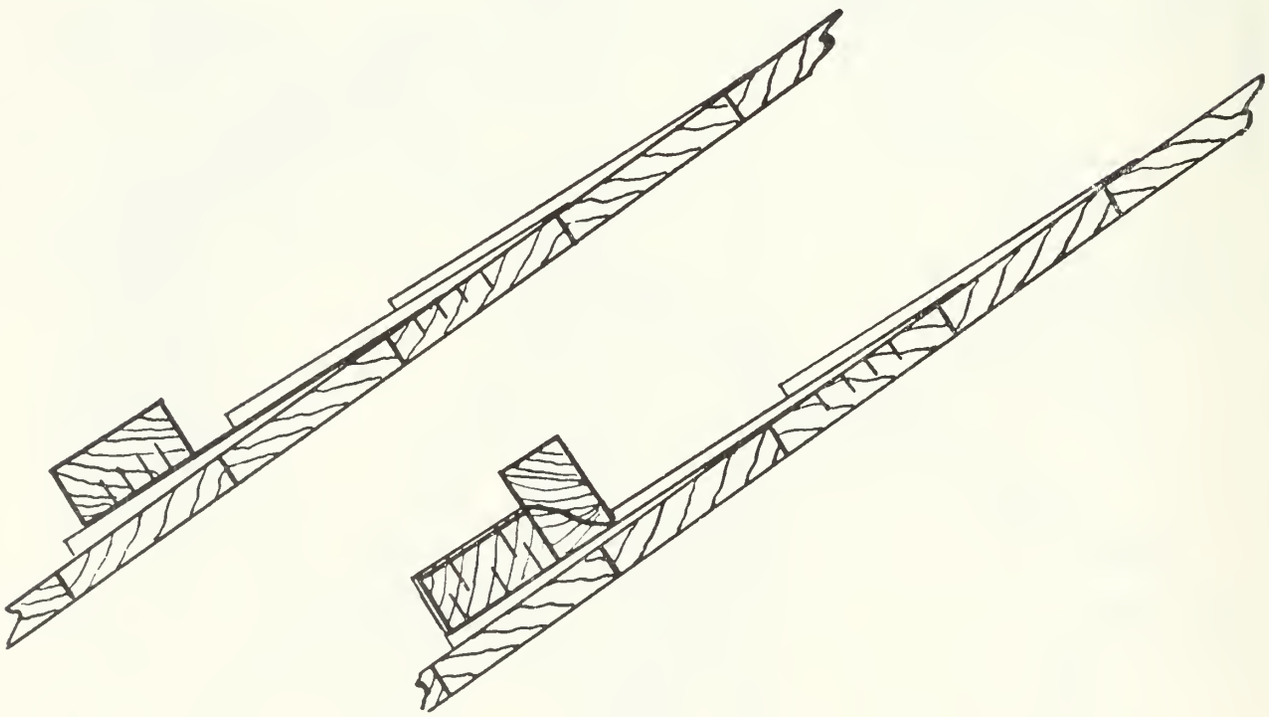
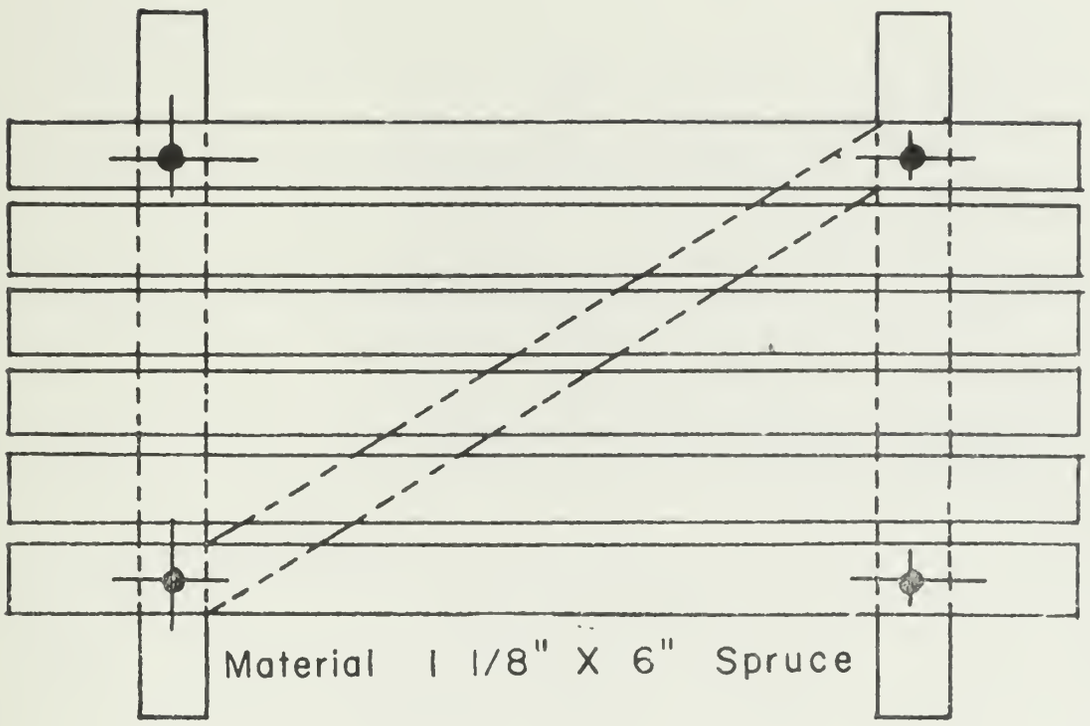


FIG. 18

FOOTLOCKS



FLOAT OR SHIP SCAFFOLD

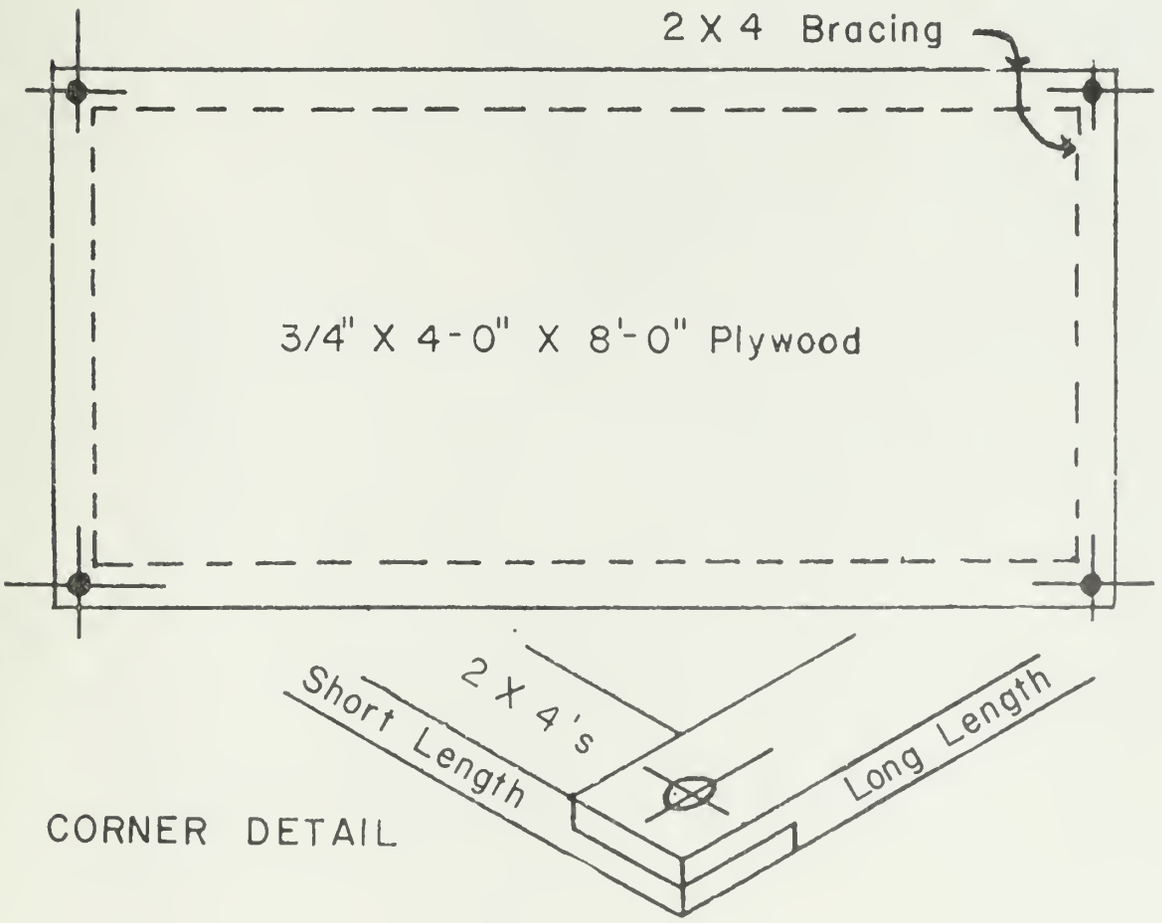
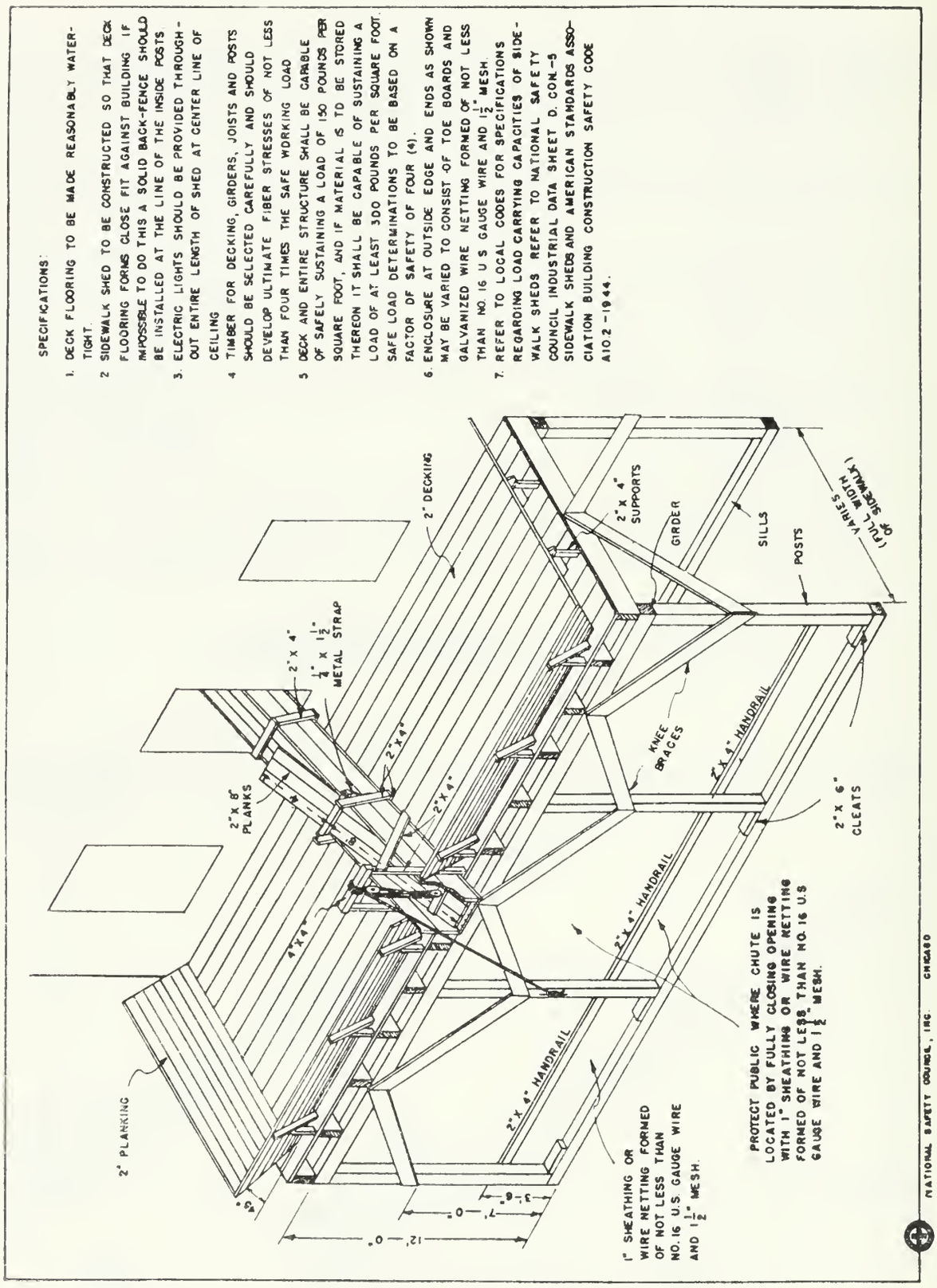


Fig. 19


SPECIFICATIONS:
1. DECK FLOORING TO BE MADE REASONABLY WATER-TIGHT.
2. SIDEWALK SHED TO BE CONSTRUCTED SO THAT DECK FLOORING FORMS CLOSE FIT AGAINST BUILDING IF IMPOSSIBLE TO DO THIS A SOLID BACK-FENCE SHOULD BE INSTALLED AT THE LINE OF THE INSIDE POSTS.
3. ELECTRIC LIGHTS SHOULD BE PROVIDED THROUGHOUT ENTIRE LENGTH OF SHED AT CENTER LINE OF CEILING.
4. TIMBER FOR DECKING, GIRDERS, JOISTS AND POSTS SHOULD BE SELECTED CAREFULLY AND SHOULD DEVELOP ULTIMATE FIBER STRESSES OF NOT LESS THAN FOUR TIMES THE SAFE WORKING LOAD.
5. DECK AND ENTIRE STRUCTURE SHALL BE CAPABLE OF SAFELY SUSTAINING A LOAD OF 150 POUNDS PER SQUARE FOOT, AND IF MATERIAL IS TO BE STORED THEREON IT SHALL BE CAPABLE OF SUSTAINING A LOAD OF AT LEAST 300 POUNDS PER SQUARE FOOT. SAFE LOAD DETERMINATIONS TO BE BASED ON A FACTOR OF SAFETY OF FOUR (4).
6. ENCLOSURE AT OUTSIDE EDGE AND ENDS AS SHOWN MAY BE VARIED TO CONSIST OF TOE BOARDS AND GALVANIZED WIRE NETTING FORMED OF NOT LESS THAN NO. 16 U.S. GAUGE WIRE AND 1/2" MESH.
7. REFER TO LOCAL CODES FOR SPECIFICATIONS REGARDING LOAD CARRYING CAPACITIES OF SIDEWALK SHEDS. REFER TO NATIONAL SAFETY COUNCIL INDUSTRIAL DATA SHEET D. CON.-5 SIDEWALK SHEDS AND AMERICAN STANDARDS ASSOCIATION BUILDING CONSTRUCTION SAFETY CODE A10.2-1944.
2" PLANKING
2"X 6" PLANKS
2"X 4" 1/4" X 1 1/2" METAL STRAP
2"X4"
4"X4"
2" DECKING
2"X 4" SUPPORTS
GIRDER
SILLS
POSTS
KNEE BRACES
2"X 4" HANDRAIL
2"X 6" HANDRAIL
2"X 6" CLEATS
VARIES (FULL WIDTH OF SIDEWALK)
1" SHEATHING OR WIRE NETTING FORMED OF NOT LESS THAN NO. 16 U.S. GAUGE WIRE AND 1/2" MESH.
PROTECT PUBLIC WHERE CHUTE IS LOCATED BY FULLY CLOSING OPENING WITH 1" SHEATHING OR WIRE NETTING FORMED OF NOT LESS THAN NO. 16 U.S. GAUGE WIRE AND 1/2" MESH.
12'-0"
7'-0"
3'-6"
NATIONAL SAFETY COUNCIL, INC. CHICAGO

TYPICAL DETAIL OF SIDEWALK PROTECTIVE SHED AFFORDING PROTECTION TO THE PUBLIC

Fig. 20